



Compiled by
the Hydrographic
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Edited by
Thomas Ley

STREAM FLOW DATA for COLORADO

Water Year 2009



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Department of Natural Resources



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State of Colorado



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PLATTE RIVER BASIN
SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR
Water Year 2009

Location.-- Lat. $38^{\circ}56'53''$, Long. $105^{\circ}41'02''$, in the SW $\frac{1}{4}$ of the NE $\frac{1}{4}$ Sec.21, T125, R76W, Park County, Hydrologic Unit 10190001, on left bank about 400 ft below the Reservoir.

Drainage and Period of Record.-- Drainage area approximately 185 square miles; flows regulated by Antero Reservoir outlet works. 1976 to current year.

Equipment.-- Stevens A-71 graphic water-stage recorder and Sutron SatLink 2 satellite Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE). The equipment is in a concrete shelter over a 48 inch concrete well with inside electric tape gage on a sharp crested Cipolletti weir with broad-crested concrete overflow walls. Well is connected to channel by two 4-inch intakes located at the same elevation. Gage is owned and maintained by the Denver Water Dept.

Hydrographic Conditions.-- Drainage area approximately 185 square miles; flows regulated by Antero Reservoir outlet works.

Gage-Height Record.-- The primary record is hourly averages of 15 minute data satellite data with chart back up. The primary record agrees with the chart to within +/-0.02 ft. The record is complete and reliable. The gage was visited sixteen times in water year 2009.

Datum Corrections.-- Levels were run on October 2, 2009 and the gage was found to be within the $\pm .02$ ft. tolerances. No instrument corrections were made.

Rating.-- The control is a 10 ft. sharp-crested Cipolletti weir with a rectangular concrete wall overflow. The overflow has sloped walls. Initially the weir employed a theoretic rating based on compound weirs. However, this proved inaccurate and a new rating, Rating MOD10FTCIP, was developed using the Cipolletti rating to a stage of 3.16 ft. Above 3.16 ft. the rating is defined to 316 cfs by measurements made in 2002 and 2003. This rating was utilized for 2009. No measurements were made in water year 2009. The peak flow of 247 cfs occurred at 0900 May 27, 2009 at a gage height of 3.47 ft with a shift of 0 ft.

Discharge.-- Shifts could be caused by moss growth and approach velocities. Regular visits ensure that the blade of the Cipolletti weir remains clean. No corrections were necessary after cleaning. By agreement with the Denver Water Board, a zero shift is used and any applied measurement shift would need sharp-crested weir accuracy. Flows can drop off during lower flow periods as the slide gates can plug with debris until the caretaker opens the gate to flush the debris out.

Special Computations.-- Peak flow occurred as the larger conduit was placed into service while release was increased. Duration was less than fifteen minutes and taken from chart data.

Remarks.-- Record is complete and rated good. Record developed by Mike Wild.

Recommendations.-- Due to limitations and / or issues associated with performing conventional current meter measurements at this site, investigation and evaluation of the weir's rating by use of an Acoustic Doppler Current Profiler (ADCP) should be considered. However, site condition suitability for ADCP use has not been evaluated as of yet, and excessive air entrainment introduced by the baffle structure located in the weir pool may preclude ADCP use.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR

RATING TABLE--

MOD10FTCIP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.7	6.1	7.6	9.8	8.2	8.1	9.8	16	70	71	6.6	4.2
2	4.7	6.1	9.3	9.8	8.1	8.1	9.8	16	99	71	6.6	4.2
3	4.5	6	10	9.8	5.6	8.1	11	16	127	71	7.6	4.2
4	4.4	5.6	10	9.8	4.4	8.2	12	14	135	61	7.1	4.4
5	4.1	5.7	10	9.9	4.2	8.2	13	14	135	48	7.1	4.4
6	4.1	5.8	10	9.8	4.2	8.2	13	14	135	39	7.1	4.5
7	4.3	5.8	10	9.8	4.2	8.2	13	9.8	135	35	7	4.5
8	4.3	5.8	11	11	4.2	9.3	14	7.9	86	35	7	4.4
9	4.4	5.8	23	13	4.2	9.7	14	7.9	62	35	7	4.4
10	4.2	5.8	29	14	4.2	9.8	14	19	62	29	7	4.4
11	4	5.8	29	14	4.2	9.8	14	24	63	26	7	4.4
12	3.8	5.8	27	14	4.2	9.8	14	24	74	23	7	4.4
13	4	5.8	25	12	4.2	9.8	14	24	81	22	7	4.4
14	4.3	5.8	25	11	3.7	9.8	14	27	81	22	7	4.3
15	4	5.8	25	9.8	4	9.8	14	28	81	22	7	4.4
16	5.8	5.8	25	9.8	4.4	9.8	14	26	80	22	7	4.4
17	6.1	5.8	25	9.8	4.4	9.8	14	24	81	22	7	4.4
18	6	7	18	9.8	4.4	9.8	14	24	63	16	6.4	4.2
19	6	7.6	14	9.8	5.7	9.8	14	36	55	13	6.4	4.2
20	6.1	7.6	9.6	9.8	6.4	9.8	14	41	55	13	6.4	4.2
21	6	7.6	6.9	8.7	6.4	9.8	14	62	55	13	6.4	4
22	6.1	7.6	6.7	8.2	6.4	9.8	14	115	55	13	6.4	3.9
23	6	7.6	8.1	8.2	7.6	9.8	14	134	55	13	6.4	4
24	6	7.6	8.8	8.2	8.2	9.8	14	136	76	13	5.5	3.8
25	5.9	7.6	8.7	8.2	8.2	9.8	14	135	83	13	4.5	3.7
26	5.9	7.6	8.5	8.2	8.2	9.8	14	140	105	13	4.4	3.7
27	6	7.6	9.5	8.2	8.1	9.8	14	161	115	13	4.3	3.9
28	6.1	7.6	9.9	8.1	8.2	9.8	15	174	114	13	4.5	3.9
29	6.1	7.6	9.8	8.2	---	9.8	16	128	114	8.9	4.4	3.9
30	6.1	7.6	9.8	8.2	---	9.8	16	81	83	6.6	4.4	3.5
31	6.1	---	9.8	8.2	---	9.7	---	69	---	6.6	4.2	---
TOTAL	160.1	197.3	449.0	307.1	158.4	291.6	408.6	1747.6	2615	822.1	193.7	125.2
MEAN	5.16	6.58	14.5	9.91	5.66	9.41	13.6	56.4	87.2	26.5	6.25	4.17
AC-FT	318	391	891	609	314	578	810	3470	5190	1630	384	248
MAX	6.1	7.6	29	14	8.2	9.8	16	174	135	71	7.6	4.5
MIN	3.8	5.6	6.7	8.1	3.7	8.1	9.8	7.9	55	6.6	4.2	3.5

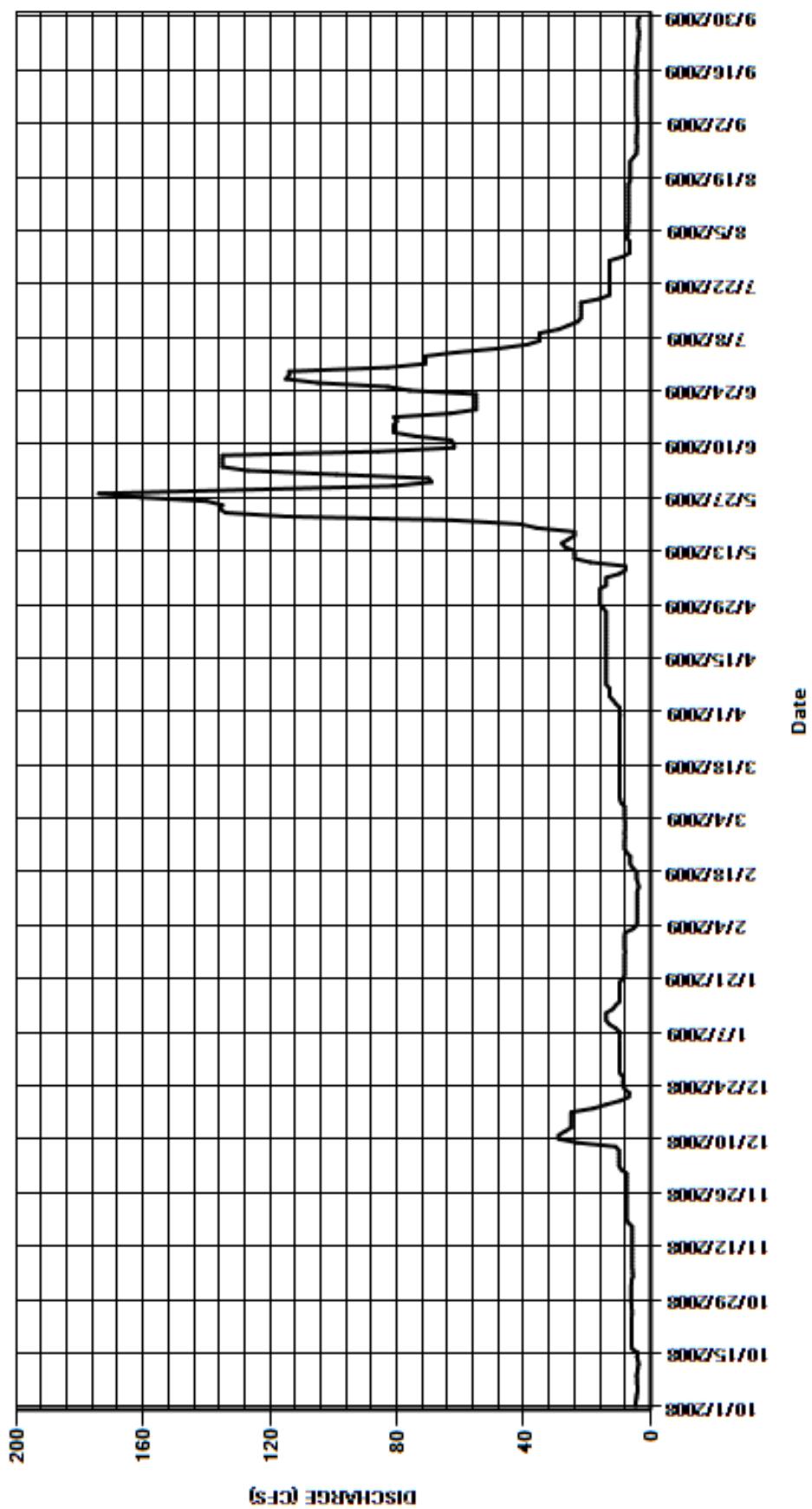
CAL YR	2008	TOTAL	11336.5	MEAN	31	MAX	179	MIN	3.8	AC-FT	22490
WTR YR	2009	TOTAL	7475.7	MEAN	20.5	MAX	174	MIN	3.5	AC-FT	14830

MAX DISCH: 247 CFS AT 09:00 ON May. 27,2009 GH 3.47 FT. SHIFT 0 FT.

MAX GH: 3.47 FT. AT 09:00 ON May. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
Water Year 2009

Location.-- Lat. $38^{\circ}59'10''$, Long. $105^{\circ}40'52''$ in NE1/4 Sec 21, T. 12S, R. 74W, Park County, 3.3 miles below the confluence of the Middle and South Forks of the South Platte River, and 7 miles southeast of Hartsel, CO.

Drainage and Period of Record.-- 772 square miles. October 1982 to present.

Equipment.-- Stevens A-71 graphic water-stage recorder and Sutron SatLink 2 satellite Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE) at a 25-foot concrete Parshall flume. The equipment is in a wooden shelter over a concrete well with inside electric tape gage and a staff gage on the left side at the Ha location. The gage and satellite monitoring equipment are owned and maintained by the City of Aurora. Aurora operates the gage seasonally and is shut down in the winter. Colorado Division of Water Resources (DWR) operates the gage for records and is paid by Aurora to provide real time data.

Hydrographic Conditions.-- Flows at the gage are affected by releases from Antero Reservoir and natural flows from the South and Middle Fork of the South Platte River.

Gage-Height Record.-- The primary record is hourly averages of 15 minute data satellite data with chart back up. The primary record agrees with the chart to within ± 0.02 ft. The record is complete and reliable except as follows: November 7, 2008 to April 7, 2009, when the gage was shut down for winter. October 22, 23, 24; and November 5, 6; when stage discharge relationship was affected by ice. On four days hourly values were compromised by flushing of the intakes. On site observation along with good chart data was used to fill in missing data without loss of accuracy. Thirty six visits were made to the gage. Two shaft encoder calibrations adjustments were necessary.

Datum Corrections.-- Levels were run on August 27, 2008. The gage was found to be reading within the $\pm .02$ ft. tolerances. No corrections were made.

Rating.-- The control is a 25-foot Parshall flume with a standard rating. Negative shifting can be caused by moss growth; however this year significant moss growth was not observed. Positive shifting is possibly caused by the approach conditions. High flows have been observed to by-pass the flume by leaving the channel and crossing the access road. This is believed to occur at gage heights greater 4.35 ft. and flows in the 1000 cfs range. The rating is well defined to 466 cfs by measurements made since 2001. Wading measurements are made downstream of the foot bridge (section width 30.5 ft) while section rod and cable measurements are made on upstream side (section width 32.1 ft). Bridge is indexed on both sides to obtain accurate section widths. Thirteen measurements (Nos. 276 - 288) were made during the water year, ranging in discharge from 36.2 to 466 cfs. They cover the range in discharge except for many days with lower mean daily flows and higher daily flows on June 2 and June 28, 2009. Peak flow of 506 cfs was recorded at 0315 June 2, 2009 at a gage height of 2.78 ft. and using a stage-distributed shift of +0.07 ft. The peak exceeded the stage of measurement No. 281 made May 27, 2009 by 0.14 ft. Using the "Water Measurement Manual" U.S. Department of the Interior Bureau of Reclamation Third Edition, Figure 8-9, Page 8-44. A 25' Parshall Flume's range of accurately measuring discharge is 15 cubic feet per second to 1200 cubic feet per second. Anything above or below this range is outside the $\pm 5\%$ accuracy. All flows during the 2009 water year were within this range during the operational period of the gage.

Discharge.-- Stage dependent shifting was used for water year. Two variable shift tables were utilized for the record with the exception of winter estimated periods. PLASPICOVST1 was used from the start of the year to measurement number 284 made on July 13, 2009 when discharge declined from the peak when the approach to the flume appears to have been scoured reducing shifting for the remainder of the year. PLASPICOVST2 was applied from measurement 284 to the end of the year to account for the channel changes. Measurements 278 and 280 were adjusted 3% and 1%, respectively, to fit the stage-shift relationship.

Special Computations.-- Estimates were made as follows: November 7, 2008 to April 7, 2009, when the gage was shut down for winter. Daily discharge for this period was estimated using Aurora's accounting. October 22, 23, 24, 2008 ice estimation using adjacent periods of good record. November 5, 6, 2008 ice estimation using adjacent periods of good record. During the period when estimates were taken from Aurora's Spinney Mountain Reservoir accounting, the estimates are based on reservoir elevation readings, and tend to show step-wise changes. The frequency of the reservoir elevations readings is daily; however surface ice on the reservoir affects the readings, so the accuracy of daily discharges is questionable.

Remarks.-- The record is good, except for the following periods which are estimated and poor: November 7, 2008 to April 7, 2009, when the gage was shut down for winter; and days of ice-affect: October 22, 23, 24, 2008; November 5, 6, 2008; and April 18, 2009. Record developed by Mike Wild.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR

RATING TABLE--

STD25FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

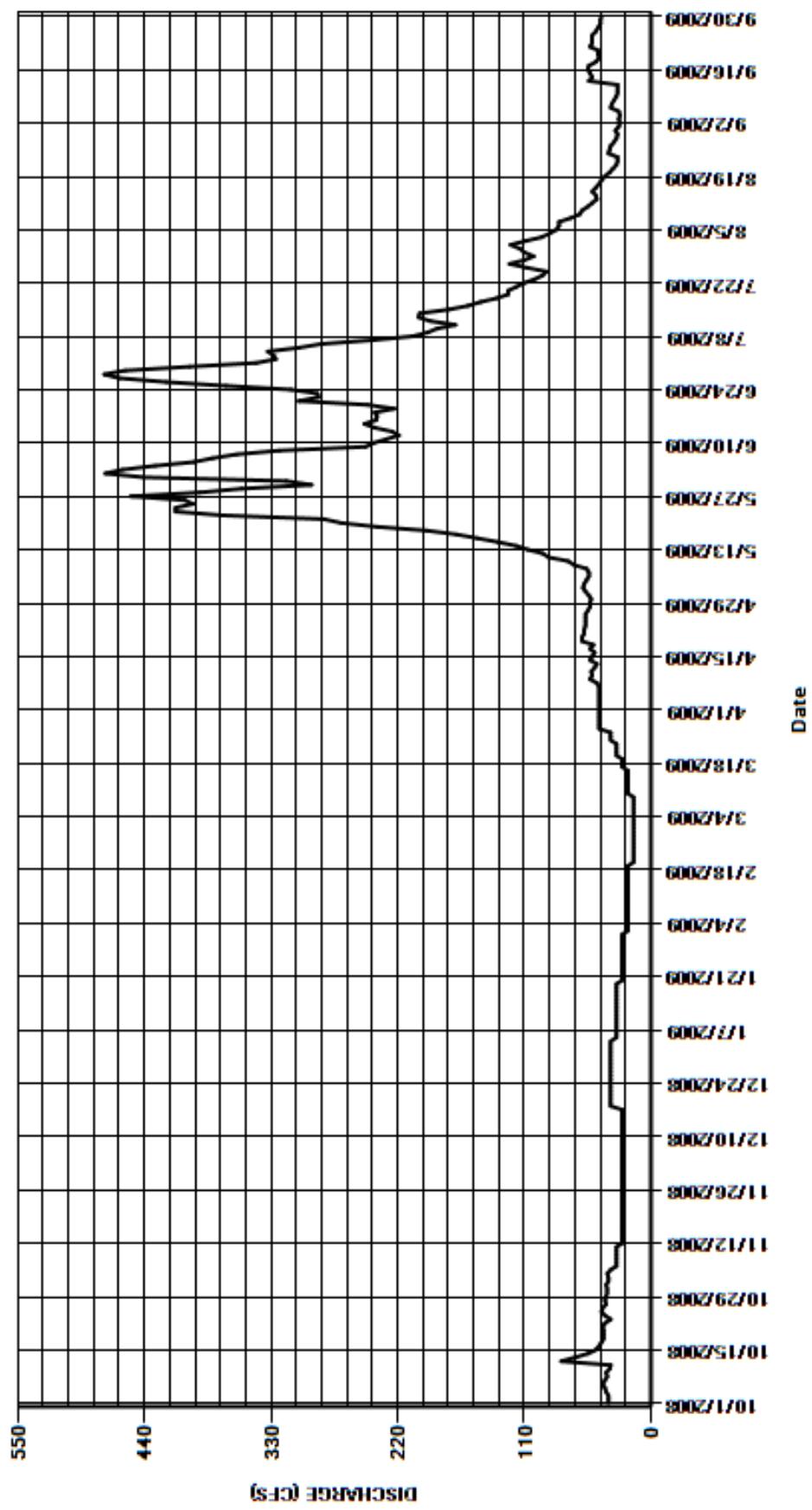
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	39	25	35	25	15	45	54	441	343	122	28
2	37	37	25	35	20	15	45	57	474	326	109	27
3	37	37	25	35	20	15	45	59	459	328	95	28
4	39	38	25	35	20	15	45	58	431	333	88	27
5	40	35	25	30	20	15	45	56	397	306	82	28
6	42	30	25	30	20	15	45	54	381	286	80	35
7	40	30	25	30	20	15	45	54	360	241	80	34
8	38	30	25	30	20	15	47	56	323	207	70	32
9	39	30	25	30	20	15	53	67	248	194	62	30
10	36	30	25	30	20	20	51	72	241	186	60	29
11	35	30	25	30	20	20	52	89	230	170	55	29
12	78	25	25	30	20	20	49	94	219	192	51	29
13	66	25	25	30	20	20	47	107	225	202	47	54
14	55	25	25	30	20	20	53	117	240	201	48	51
15	48	25	25	30	20	20	51	133	249	176	51	53
16	45	25	25	30	20	20	49	151	239	159	48	55
17	43	25	25	30	20	25	53	169	238	148	45	54
18	41	25	35	30	20	25	50	195	240	134	43	48
19	41	25	35	30	20	25	60	238	223	124	40	45
20	41	25	35	25	15	30	60	269	246	124	36	46
21	42	25	35	25	15	30	58	284	306	117	33	46
22	40	25	35	25	15	30	58	372	289	110	30	53
23	35	25	35	25	15	30	57	413	290	101	29	51
24	40	25	35	25	15	35	57	413	313	94	29	51
25	43	25	35	25	15	35	57	398	369	91	37	51
26	42	25	35	25	15	35	57	405	421	108	36	48
27	39	25	35	25	15	45	55	452	462	123	35	46
28	40	25	35	25	15	45	53	392	475	110	32	44
29	39	25	35	25	---	45	53	356	457	102	30	44
30	38	25	35	25	---	45	52	295	401	110	29	43
31	38	---	35	25	---	45	---	317	---	114	31	---
TOTAL	1314	841	915	890	520	800	1547	6246	9887	5560	1663	1239
MEAN	42.4	28	29.5	28.7	18.6	25.8	51.6	201	330	179	53.6	41.3
AC-FT	2610	1670	1810	1770	1030	1590	3070	12390	19610	11030	3300	2460
MAX	78	39	35	35	25	45	60	452	475	343	122	55
MIN	35	25	25	25	15	15	45	54	219	91	29	27

CAL YR	2008	TOTAL	38621	MEAN	106	MAX	464	MIN	10	AC-FT	76600
WTR YR	2009	TOTAL	31422	MEAN	86.1	MAX	475	MIN	15	AC-FT	62330

MAX DISCH: 506 CFS AT 03:15 ON Jun. 02,2009 GH 2.78 FT. SHIFT 0.07 FT.
MAX GH: 2.78 FT. AT 03:15 ON Jun. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
Water Year 2009

Location.--	Lat. 38°58'03", Long. 105°34'51", in NE $\frac{1}{4}$ sec. 32, T.12 S., R.73 W., Park County, Hydrologic Unit 10190001, on left bank 200 ft downstream from highway bridge, 2.5 mi upstream from water line of Elevenmile Canyon Reservoir, at elevation 8,561 ft. and 13 mi southeast of Hartsel.
Drainage and Period of Record.--	880 mi ² ; 1933 to present.
Equipment.--	Stevens A-71 graphic water-stage recorder and Sutron SatLink 2 satellite Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE) at a 25-foot concrete Parshall flume. The equipment is in a wooden shelter over a concrete well with inside electric tape gage and a staff gage on the right side at the Ha location. Facilities are owned and maintained by the Denver Water Board. Satellite instrumentation is owned and maintained by the State Engineers Office.
Hydrographic Conditions.--	The gage is approximately two miles below Spinney Mountain Reservoir, and flow is controlled by reservoir releases. A small drainage empties in above the gage that is not controlled by the reservoir. This drainage can contribute significant flow after severe local rain events. The record is flat with step changes.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart back up. The primary record agrees with the chart to within 0.02 ft. Generally releases above about 80 cfs from Spinney Mountain Reservoir keep this gage open year round. Lower flows can see ice affect at the flume in 2 ways: Ice jams downstream can cause backwater into the flume which can result in ice forming on the crest and walls of the flume. Also, ice jams upstream can cause a drop in flow followed by a surge. This can result in an accumulation of ice above the normal water line for that release period, as each brief surge hits the frozen flume walls. In this situation, the baseline GH's will be lower than the ice layers and be good record, but the higher surge GH's will be ice-affected. In either case, the GH record will not be the flat release expected and the computed flows will be higher than either Spinney release data or computed good record for that Spinney release period. Ice affects seen on days when a change is made in Spinney release are more complicated since there is a delay between gate changes at Spinney Reservoir and the gage, as return flows are seen following gate change reductions. The record is complete and reliable except for the following periods when the stage discharge relationship was affected by ice: November 15, 24-26, 29, 2008. December 1-6, 9-12, 15-21, 24, 27, 28, 2008, January 5-7, 13, 27-29, 31, 2009. Moss was cleaned from the flume on two occasions causing a drop in gage height following cleaning. Measurements were taken following the moss removal and datum corrections were utilized to account for the moss growth and applied back to the previous measurement on the following dates: November 3, 2008 (-0.01 ft) July 24, 2009 (-0.03 ft)
Datum Corrections.--	Levels were run on August 27, 2008. No instrument corrections were needed.
Rating.--	The control is a 25 ft. concrete Parshall flume. A standard rating has been used since the flume was installed in 1940. Rating No. 15, dated Oct. 1, 1970 is an expansion of the standard equation. Any flow by-passing the flume would be accounted for separately and not computed as part of this rating. Shifts are caused by moss growth at low stages and by approach conditions at higher stages. Eighteen measurements (Nos. 840 - 856) were made this year, ranging in discharge from 38.5 to 458 cfs. Peak flow of 475 cfs was recorded at 1730 June 3, 2009 at a gage height of 2.70 ft. with a shift a 0.04 ft. It exceeded measurement number 840 made that same day by 0.13 ft. in stage. Using the USBR "Water Measurement Manual" Third Edition, a 25' Parshall Flume has an accurate measuring range from 15 cfs to 1200 cfs. Anything above or below this range is outside the +/- 5% accuracy. All flows during the water year were within this range.
Discharge.--	Shifting control method was used all year. Measurements show shifts ranging between -0.10 and 0.04 ft. Shifts were applied as follows: October 1, 2008 to June 3, 2009: Stage-shift table PLAHARCOVST1 was used. Measurements 840-849 made during the period were all used, No. 842 being adjusted 1% to fit the table. June 3 to June 24, 2009: Shifts were run by time with consideration to stage, holding the +0.04 shift from June 3 to June 10. June 24 to July 24: Shifts were run by time to account for moss growth. Flume was cleaned on July 24, and gravel traveling through the flume was observed to be reducing moss effects. July 24 to September 30, 2009: Stage shift table PLAHARCOVST1 was again used. Measurements 853-856 made during the period fit into the table when Nos. 853 and 855 were adjusted 2% and 4%. Due to the filling of the weir pool following peak flows for the year, velocities have increased and become inconsistent in the measurement section of the flume. Measurements 855 was adjusted less than five percent to match the release from Spinney Mountain Reservoir. The discharge at the time was known to come from the new 42" mag meter which has proven accuracy. Extremely high flows can bypass the gage through a culvert to the south. This did not occur this year.
Special Computations.--	Shifting by time with consideration to stage between measurements 849 (June 3) and 850 (June 24) was actually accomplished by extending the shift table used prior to June 3 through to June 10. It was assumed that the moss effects increased as the stage decreased below the peak levels measured on June 3. Many ice days were estimated without loss accuracy, since these ice days fell in periods when the release by Spinney Reservoir remained constant. The remaining ice days were estimated from adjacent reliable record.
Remarks.--	Record is rated good, except for periods of ice, which are considered fair: November 30, December 7, 14, 23, 31, 2008, January 4, 10, 15, 16, 18, 21, 2009. Station maintained and record developed by Mike Wild.
Recommendations.--	Weir pool cleaning has been scheduled for early 2010.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR

RATING TABLE--

STD25FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

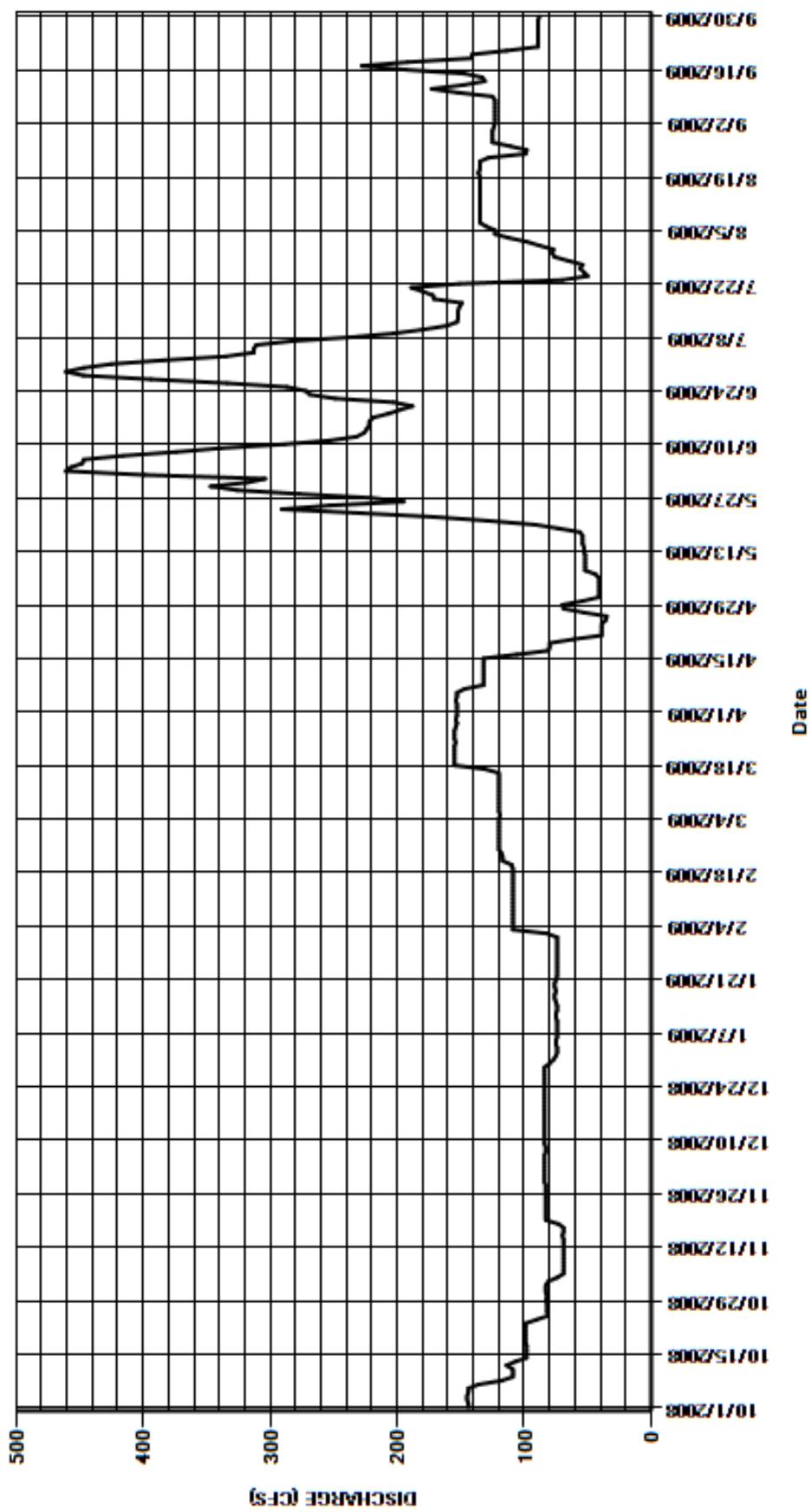
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	144	83	84	75	74	120	153	41	304	425	88	124
2	144	83	84	74	82	120	153	41	399	384	98	123
3	145	81	84	74	109	120	153	41	461	335	112	123
4	145	74	84	75	109	120	154	41	457	313	123	123
5	144	69	84	75	109	119	153	41	448	313	123	123
6	144	69	84	74	109	120	153	41	447	311	130	123
7	136	69	83	74	109	120	147	44	416	283	135	123
8	118	69	83	74	109	120	132	52	374	237	135	123
9	109	69	84	74	109	120	132	52	339	203	135	125
10	109	69	84	74	109	120	132	52	289	180	135	152
11	109	69	84	75	109	120	132	52	253	161	135	173
12	114	69	84	75	109	120	132	52	232	153	135	148
13	107	69	84	74	109	120	132	53	226	152	135	131
14	98	69	84	74	109	120	132	53	224	152	135	133
15	98	70	84	75	109	120	132	54	222	152	135	147
16	98	69	84	76	109	120	106	54	222	151	135	193
17	98	69	84	76	109	131	81	54	219	149	135	228
18	99	73	84	75	109	155	80	56	207	171	135	192
19	99	83	84	76	109	155	80	73	198	172	135	141
20	99	83	84	76	110	155	61	92	188	180	136	141
21	99	83	84	75	117	155	39	129	203	189	135	114
22	99	83	84	74	117	155	39	171	249	151	135	89
23	99	83	84	74	118	155	39	228	269	70	135	89
24	90	83	84	74	120	154	39	291	272	50	128	89
25	81	83	84	74	120	155	36	253	287	53	99	89
26	82	83	84	74	120	155	35	195	334	56	98	89
27	82	83	84	74	120	155	53	221	394	54	111	89
28	82	83	84	74	120	154	69	277	447	65	125	89
29	83	84	84	74	---	153	70	326	461	76	125	89
30	82	84	80	74	---	154	54	347	447	78	125	88
31	83	---	77	74	---	153	---	318	---	77	125	---
TOTAL	3319	2290	2591	2310	3071	4213	3003	3795	9488	5496	3906	3803
MEAN	107	76.3	83.6	74.5	110	136	100	122	316	177	126	127
AC-FT	6580	4540	5140	4580	6090	8360	5960	7530	18820	10900	7750	7540
MAX	145	84	84	76	120	155	154	347	461	425	136	228
MIN	81	69	77	74	74	119	35	41	188	50	88	88
CAL YR	2008	TOTAL	49402	MEAN	135	MAX	420	MIN	35	AC-FT	97990	
WTR YR	2009	TOTAL	47285	MEAN	130	MAX	461	MIN	35	AC-FT	93790	

MAX DISCH: 475 CFS AT 17:30 ON Jun. 03,2009 GH 2.7 FT. SHIFT 0.04 FT.

MAX GH: 2.77 FT. AT 14:30 ON Jun. 28,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE

Water Year 2009

Location.--	Lat. 38°54'19", Long. 105°28'22". in SW¼ sec. 20, T.13 S., R.72 W., Park County, Hydrologic Unit 10190001, on left bank 700 ft downstream from Elevenmile Canyon Reservoir and 8.2 mi southwest of town of Lake George.
Drainage and Period of Record.--	963 mi ² . October 1929 to current year. Monthly data only for some periods.
Equipment.--	Stevens A-71 graphic water-stage recorder and Sutron SatLink 2 satellite monitoring Data Collection Platform (DCP) with Sutron 56-0540 shaft encoder (SE) in a concrete shelter, at a 15-foot concrete Parshall flume. Primary reference is an inside tape gage, and there is an enameled staff gage on the right side of the flume at the Ha location. The gage has power, and the shelter is heated during cold weather. The gage is owned and maintained by the Denver Water Department. A 10-foot rectangular bypass channel is located beside the upper right wing wall of the 15-foot Parshall. The channel is normally kept closed by boards. At a gage height of 3.40 ft. in the Parshall, water reaches the floor of the bypass channel.
Hydrographic Conditions.--	Natural flow of stream affected by storage variations in Eleven Mile Reservoir (capacity 97,780 acre feet), Spinney Mountain Reservoir releases (capacity 53,651 acre feet), transmountain diversions from the Homestake pipeline into Spinney Reservoir, Antero Reservoir releases (capacity 22,300 acre feet) and diversions for irrigation and return flow from irrigated areas. Abrupt gage height fluctuations are experienced at this gage when the reservoir is spilling. Prevailing winds cause waves of water to wash over the spillway. The gage is close to the spillway channel and experiences the waves as rises and dips of unpredictable magnitude.
Gage-Height Record.--	The primary record is hourly averages of 15 minute data satellite data with chart back up. The primary record agrees with the chart to within 0.02 ft. The record is complete and reliable. Instrument calibration was verified by seventeen visits made to the gage. Two SE adjustments were made on January 15, 2008 (- 0.06 ft) and September 28, 2009 (0.015 ft).
Datum Corrections.--	Levels were run on September 28, 2009 using RM4 as a base. Gage was found reading 0.015 ft. low. Tape length was adjusted from 8.39 to 8.405 ft and an instrument correction of +0.015 ft was made. A measurement was made the following day and the shift was applied back to the SE correction made on September 28, 2009 at 13:50 hours when the tape was adjusted. Measurement GH's and shifts prior to September 28 were not adjusted.
Rating.--	The control is a standard 15-foot Parshall flume. Rating No. 4, dated October 1, 1971, a standard Parshall flume table was used for the record. The by-pass was not used this year. A rating for the bypass was developed in 1995 and is included in the record. All flow in water year 2009 passed through the 15 foot Parshall flume. Fifteen measurements (Nos. 1073 - 1087) were made, ranging in discharge 53.5 to 317 cfs. The USBR "Water Measurement Manual" Third Edition shows a 15 ft Parshall Flume range of accurate discharge measurement is 8 cfs to 600 cfs. Anything above or below this range is outside the +/- 5% accuracy. All flows during the 2009 water year were within this accuracy range. Average daily flow was above the highest measurement of 317 cfs on June 3-11, June 29-July 7, 2009. The peak flow of 504 cfs occurred at 1615 July 2, 2009 at a gage height of 3.82 ft with a shift of 0.05 ft. It exceeded measurement No. 1081, made on June 3, by 0.98 ft. in stage.
Discharge.--	Shifting control method was used for the entire year. Shifts are caused by moss growth and approach conditions. Unadjusted shifts ranged from 0.01 to 0.05 feet. Shifts were applied by as follows: October 1 , 2008 to June 3, 2009: Time distribution with all measurements given full weight. June 3 to July 13, 2009: Stage distribution, using the measurements made during the period, Nos. 1081-1083. All were given full weight. July 13 to September 30, 2009: Time distribution with all measurements given full weight. A +0.015 ft correction was made to the tape length when levels were run on September 28, 2009, and this correction was taken up in the shifts as follows: the +0.03 shift measured on September 15 was run to 13:50 on September 28. After this time the +0.01 shift measured on September 29 was used. When clean, the flume will often show positive shifting, possibly due to approach velocities. Moss growth causes negative shifting.
Special Computations.--	On December 12, 2008 a Denver Water Board (DWB) employee replaced a light bulb on a fixture in the stilling well and caused the float tape to slip on the SE wheel. A -0.06 ft correction was used from December 12, 2008 09:45 to January 15, 2009 09:45 when the problem was discovered. As discussed, the levels correction was taken up in the shifts. The amount of the correction represented the exact difference between shifts preceding and following the adjustment.
Remarks.--	The record is considered good. Station maintained and record developed by Mike Wild .
Recommendations.--	Replace chart recorder with an SDR and set data collection frequency to five minutes to help determine GH's during measurements. Approach conditions to the flume cause velocities greater than 0.5 ft/s in the weir pool. Weir pool needs work to slow velocities.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE

RATING TABLE-- STD15FTP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

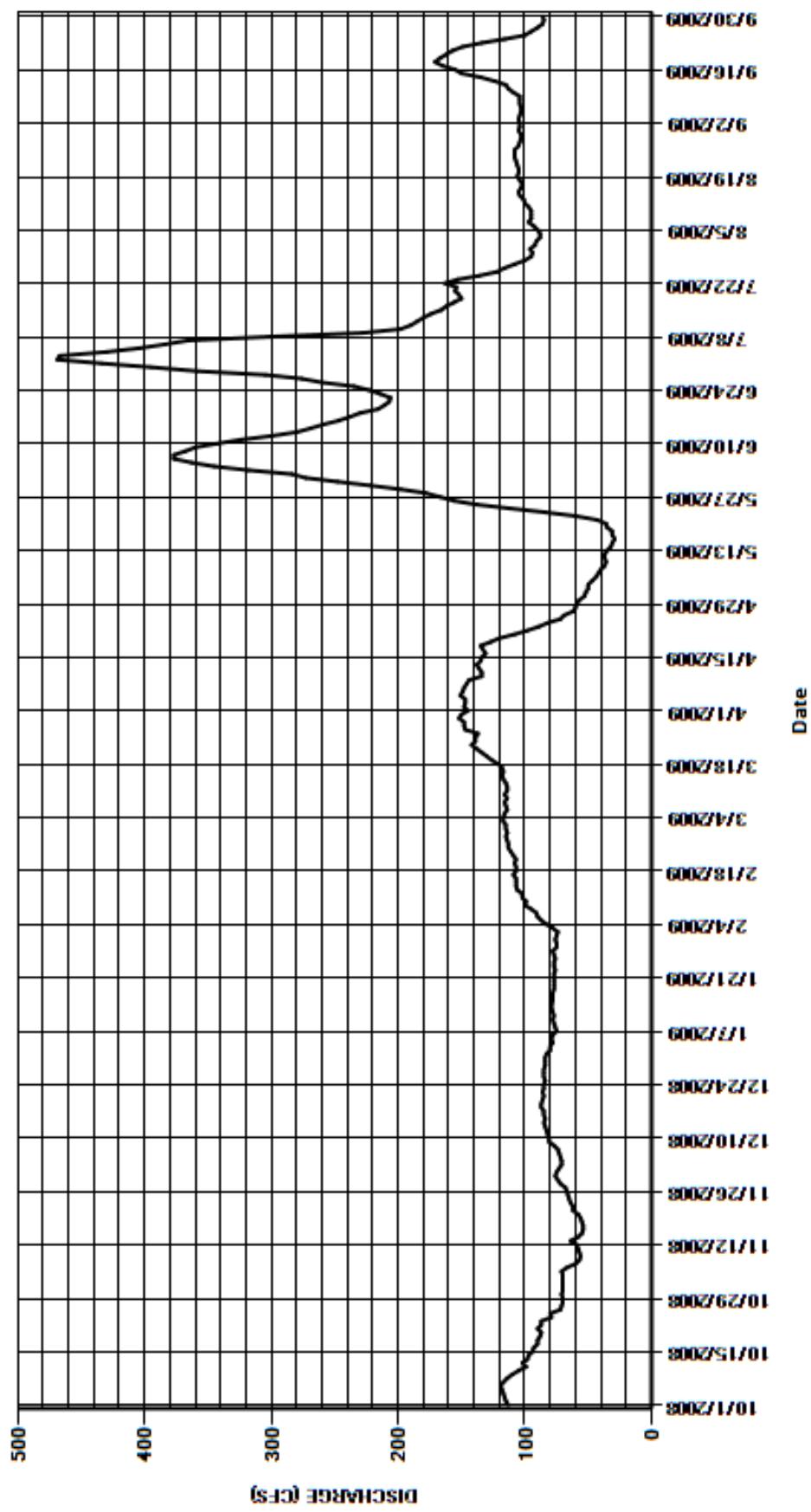
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	113	70	75	83	75	115	145	53	273	434	92	104
2	115	70	73	80	74	115	148	52	284	469	91	104
3	116	70	71	80	78	117	147	50	318	467	88	105
4	117	70	71	78	83	117	147	50	345	430	88	104
5	118	71	72	79	87	116	151	47	363	404	90	103
6	119	67	73	78	90	114	149	44	377	384	93	103
7	117	60	74	75	91	115	148	42	377	366	97	104
8	114	57	77	76	95	116	146	40	368	301	95	104
9	110	56	81	77	100	114	144	37	360	228	95	104
10	105	57	81	78	99	116	134	36	343	198	95	109
11	99	58	82	77	102	114	134	37	324	190	97	113
12	102	59	83	78	102	114	136	37	300	185	100	115
13	98	64	84	79	106	115	138	35	280	180	101	124
14	97	58	85	79	107	117	135	32	269	174	104	135
15	94	55	84	78	107	118	134	31	259	166	105	150
16	93	54	85	78	107	117	131	29	247	162	103	155
17	90	54	85	78	109	118	133	31	238	156	102	165
18	90	55	87	77	107	121	135	31	230	150	104	171
19	88	56	87	77	107	126	127	35	216	152	106	167
20	87	58	86	77	108	130	120	36	211	155	105	162
21	90	62	85	77	107	134	108	43	207	154	105	157
22	87	62	86	77	109	138	98	60	206	163	106	149
23	87	64	85	76	111	142	89	84	214	153	107	134
24	79	65	85	77	113	139	82	112	223	136	108	116
25	80	66	84	77	113	139	72	138	235	122	108	100
26	72	67	85	76	114	137	69	156	260	116	108	95
27	71	68	85	77	115	147	62	167	276	108	105	90
28	70	72	85	78	114	148	60	178	305	100	104	86
29	70	74	84	75	---	148	59	198	359	95	103	85
30	71	76	84	75	---	152	57	222	395	94	103	86
31	70	---	84	76	---	150	---	248	---	96	105	---
TOTAL	2929	1895	2528	2403	2830	3919	3538	2391	8662	6688	3113	3599
MEAN	94.5	63.2	81.5	77.5	101	126	118	77.1	289	216	100	120
AC-FT	5810	3760	5010	4770	5610	7770	7020	4740	17180	13270	6170	7140
MAX	119	76	87	83	115	152	151	248	395	469	108	171
MIN	70	54	71	75	74	114	57	29	206	94	88	85
CAL YR	2008	TOTAL	46551	MEAN	127	MAX	416	MIN	53	AC-FT	92330	
WTR YR	2009	TOTAL	44495	MEAN	122	MAX	469	MIN	29	AC-FT	88260	

MAX DISCH: 504 CFS AT 16:15 ON Jul. 02,2009 GH 3.82 FT. SHIFT 0.05 FT.

MAX GH: 3.82 FT. AT 16:15 ON Jul. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
TARRYALL CREEK AT BORDEN DITCH
Water Year 2009

Location.--	Lat. 39°17'13", Long. 105°41'43", in the NW ¼ of the NW ¼ of Sec. 8, T. 9 S., R. 74 W., Park County, Hydrologic unit 10190001, on left bank 1800 ft. downstream from Rock Creek, 9 mi. southeast of Jefferson and 1.0 mi. northwest of Bordenville.
Drainage and Period of Record.--	230 mi ² . Apr. 26, 1983 (no previous gage at this site). Operation discontinued by USGS Sept 30, 1997. Taken over by Colorado Division of Water Resources.
Equipment.--	Sutron SatLink 2 satellite monitoring data collection platform (DCP) with a Sutron 56-0540 shaft encoder (SE) enclosed in a steel box shelter atop a 18 inch corrugated metal pipe (CMP) mounted vertically on the stream bank. The primary gage reference is a drop tape and shelf mounted reference point (RP) with a supplementary outside staff gage. Gage and equipment are owned by City of Aurora and operated by the Colorado Division of Water Resources under contract with the City of Aurora.
Hydrographic Conditions.--	High mountain alluvial plateau mostly devoid of forest. Conditions remain stable with continued light residential development upstream. Discharge affected by irrigation diversions and releases from Jefferson Lake.
Gage-Height Record.--	The record is hourly averages of telemetered 15-minute shaft encoder data. The record is complete and reliable, except as follows: October 22, 2008 to November 3, 2008, when the gage was affected by ice conditions; November 4, 2008 and April 13, 2009, partial day records (shut-down and start-up days), November 4, 2008 through April 14, 2009, when the station was off for winter and no record is maintained. Instrument calibration was verified by twenty-eight visits made to the gage. One SE adjustment (0.02 ft) was made on May 18, 2009.
Datum Corrections.--	Levels were run on September 27, 2009. It was not possible to correlate elevations gained to levels run by City of Aurora personnel nor USGS staff when the gage was in their control. Therefore, elevations for reference marks RM 1 and RM 3 were reassigned as follows: RM 1 reassigned from 7.274 to 7.034 feet, and RM3 reassigned from 8.742 to 8.505 feet. RM 2 was not located and abandoned.
Rating.--	The control at low to medium flows is a rock riffle downstream composed of gravel and some large boulders. The stream channel is the control for higher stages up to an approximate gage-height of 6.00 ft where the channel is subject to overflow. Rating No. 6 was used all year and is well defined between 18.4 and 247 cfs. It is valid for the range of flows experienced this year. Eleven measurements (Nos. 69 - 79) were made, ranging in discharge from 18.8 to 188 cfs. Average daily flow was above the highest measurement of 188 cfs on the following days: May 22-27, June 1-6, 21, 22, 2009. Peak discharge of 308 cfs occurred at 0415 June 2, 2009 at a gage height of 4.15 ft with a shift of 0.00 ft. The peak exceeded measurement No. 73 by 0.65 feet in stage.
Discharge.--	Shifting control method was used all year. Shifting is caused by the movement of material (sand, silt, rocks, and boulders) across the control and gage pool sections. Frost heave can affect the first measurements of the spring, since the creek thaws before the ground does. Unadjusted shifts ranged from -0.03 to 0.11 feet. Shifts were applied as follows: October 1 through October 21, 2008; Time proration as defined by measurement Nos. 68-69 April 14 through April 30, 2009; Time proration as defined by measurement Nos. 70-71 April 30 through June 2, 2009, (04:15) Stage dependant shifting using variable shift table TARBORCOVST1 which is defined by three measurements (Nos. 71-73) made during the period of use. June 2 through September 31, 2009; Stage dependant shifting using variable shift table TARBORCOVST2 which is defined by eight measurements (Nos. 74-80) made during the period of use. Measurement Nos. 74, 75, 77 and 79 were adjusted to better fit the shift distribution as follows: No. 74 was adjusted -1% from a computed shift of -0.02 feet to a shift of 0.00 feet No. 75 was adjusted 2% from a computed shift of +0.04 feet to a shift of 0.03 feet No. 77 was adjusted -5% from a computed shift of -0.01 feet to a shift of 0.02 feet No. 79 was adjusted 4% from a computed shift of 0.04 feet to a shift of 0.02 feet
Special Computations.--	Discharge for the ice affected period was based on computed record for Oct 22-24, 27-31 and Nov. 1-3. Adjacent computed flows were used for Oct. 25, 26. Gage heights showed a marked temperature effect. The degree of ice effect was not easy to determine. Nov. 1-3 showed the least such effects, had warm temperatures and is likely good record. However, we do not have any observations recorded by Aurora when they closed the gage on Nov. 4 and cannot say for sure that ice was not present. So while the period is bracketed by what appear to be reliable numbers, it is still considered to be estimated and poor. This is a partial year record. No discharge record is kept for the winter period (November 4, 2008 through April 14, 2009).
Remarks.--	The record is rated good, except for October 22—Nov. 3 which is estimated and poor. No estimates were made for the winter period from Nov 4, 2008 through April 14, 2009 as the gage is considered seasonal. Station maintained and record developed by Mike Wild.
Recommendations.--	The supplemental staff gage should be replaced and calibrated to match the station primary reference. Levels must be run next season when soil conditions stabilize after winter freeze and thaw cycles.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

TARRYALL CREEK AT BORDEN DITCH

RATING TABLE--

TARBORCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	18	---	---	---	---	---	41	254	126	82	22
2	22	19	---	---	---	---	---	41	283	118	65	20
3	22	19	---	---	---	---	---	40	263	122	57	21
4	24	---	---	---	---	---	---	39	223	117	54	21
5	23	---	---	---	---	---	---	39	205	108	50	21
6	23	---	---	---	---	---	---	41	198	114	46	21
7	22	---	---	---	---	---	---	44	180	104	52	24
8	22	---	---	---	---	---	---	52	174	93	45	25
9	21	---	---	---	---	---	---	57	165	85	42	24
10	20	---	---	---	---	---	---	64	157	81	38	22
11	21	---	---	---	---	---	---	71	158	89	36	20
12	57	---	---	---	---	---	---	78	155	99	33	22
13	41	---	---	---	---	---	25	92	147	106	36	51
14	30	---	---	---	---	---	25	95	146	105	38	39
15	26	---	---	---	---	---	21	107	149	93	38	53
16	24	---	---	---	---	---	25	112	141	81	35	40
17	24	---	---	---	---	---	23	114	137	74	34	29
18	23	---	---	---	---	---	19	122	130	76	34	24
19	23	---	---	---	---	---	18	138	132	74	31	24
20	22	---	---	---	---	---	31	137	143	75	28	24
21	23	---	---	---	---	---	59	153	191	75	25	26
22	21	---	---	---	---	---	56	214	165	71	24	30
23	17	---	---	---	---	---	37	206	147	66	25	27
24	19	---	---	---	---	---	31	198	146	62	24	26
25	21	---	---	---	---	---	26	194	176	63	29	28
26	21	---	---	---	---	---	26	198	205	87	30	27
27	21	---	---	---	---	---	34	223	177	107	26	25
28	20	---	---	---	---	---	34	166	153	69	24	23
29	19	---	---	---	---	---	31	149	149	59	23	22
30	19	---	---	---	---	---	35	157	132	86	24	21
31	18	---	---	---	---	---	---	184	---	93	24	---
TOTAL	730	56	---	---	---	---	556	3566	5181	2778	1152	802
MEAN	23.5	18.7	---	---	---	---	30.9	115	173	89.6	37.2	26.7
AC-FT	1450	111	---	---	---	---	1100	7070	10280	5510	2280	1590
MAX	57	19	---	---	---	---	59	223	283	126	82	53
MIN	17	18	---	---	---	---	18	39	130	59	23	20

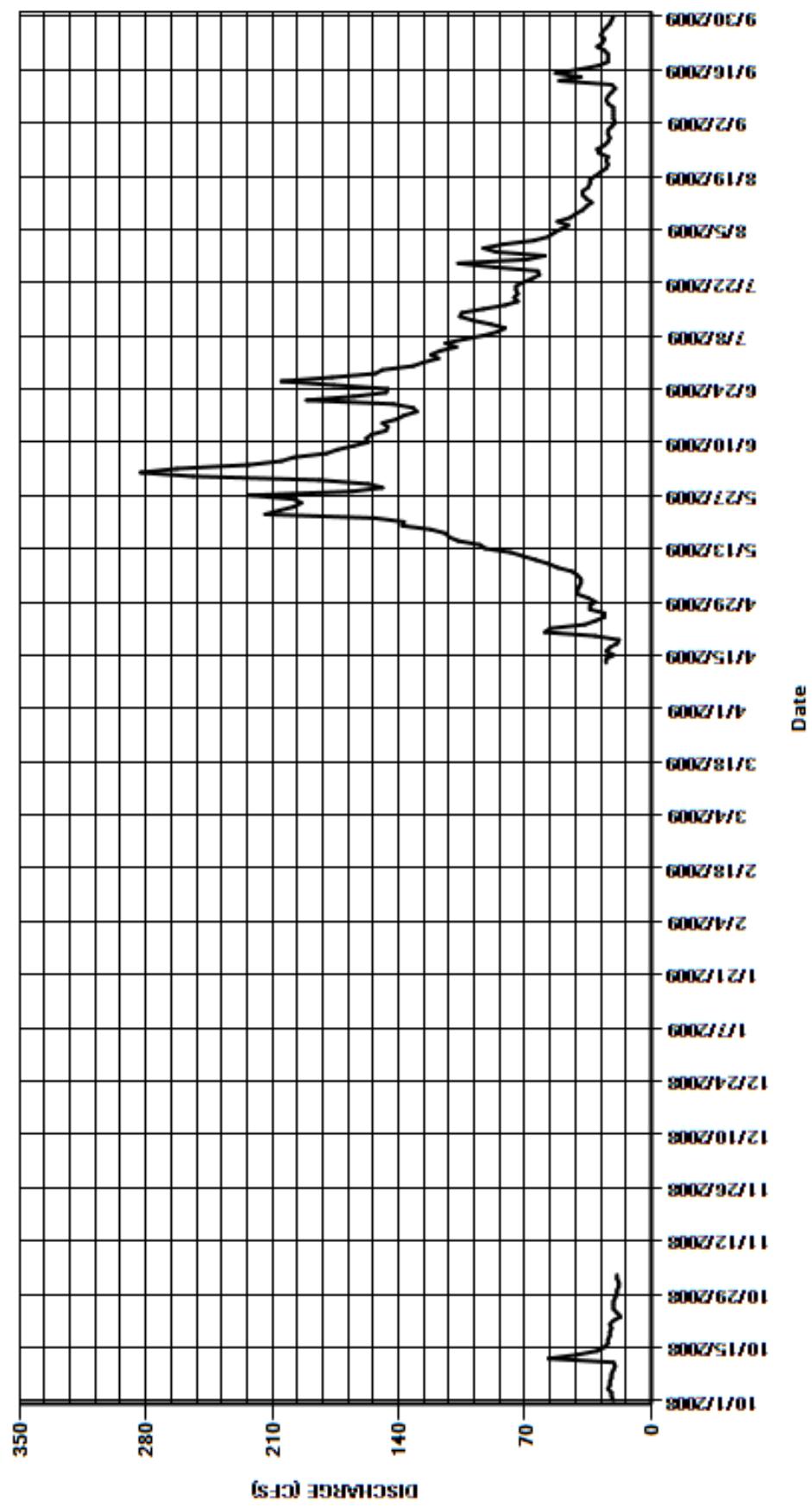
CAL YR	2008	TOTAL	14793	MEAN	73.2	MAX	193	MIN	17	AC-FT	29340	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	14821	MEAN	72.3	MAX	283	MIN	17	AC-FT	29400	(PARTIAL YEAR RECORD)

MAX DISCH: 308 CFS AT 04:30 ON Jun. 02,2009 GH 4.15 FT. SHIFT 0 FT.

MAX GH: 4.15 FT. AT 04:30 ON Jun. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

TARRYALL CREEK AT BORDEN DITCH
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
TARRYALL CREEK BELOW TARRYALL RESERVOIR
Water Year 2009

Location.--	Lat. 39°13'18", Long. 105°36'07"; in SW1/4 of sec 31, T. 9S, R. 73W, Park County, about 500 ft. downstream from Tarryall Reservoir.
Drainage and Period of Record.--	355 sq. mi., from DWR Dam Safety Section database. Age of the gage is not known, although the reservoir was built in 1929. DWR first ran levels in June of 1975, and installation in 1970's is consistent with the type of materials used. The gage has been operated infrequently and records have never been kept prior to 2005.
Equipment.--	Sutron SatLink 2 satellite Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE) in a 36" CMP structure located on the right downstream abutment of a bridge on Park County Road 77. Gage is operated and equipment is maintained by the Colorado Division of Water Resources (DWR) under a cooperative agreement with the Colorado Division of Wildlife (DOW), the owner of Tarryall Reservoir. There is an inside reference tape and a staff gage on the center abutment of the bridge.
Hydrographic Conditions.--	Natural flow of stream affected by storage in Tarryall Reservoir and diversions for irrigation and return flow from irrigated areas.
Gage-Height Record.--	Primary record is hourly averages of telemetered 15-minute shaft encoder data. The record is complete and reliable, except as follows: November 9-25, 2008 when the gage was possibly affected by ice conditions; November 25, 2008 and April 7, 2009, partial day records (shut-down and start-up days); and, November 26, 2008 through April 7, 2009, when the station was off for winter and no record is maintained. Instrument calibration was verified by twenty five visits made to the gage. No SE adjustments were necessary.
Datum Corrections.--	Levels were run on August 27, 2008 from the reference mark on the southwest bridge abutment to the RP by DWR personnel. RP was found to be 0.014 ft low. No correction was made.
Rating.--	Rating TARTARCO02, dated August 30, 1977 has been used since the gage was placed back into service in WY2004. It is defined by measurements from 3.65 to 206 cfs. Shifting is caused by the movement of material (sand, silt, rocks, and boulders) across the control. Frost heave can affect the first measurements of the spring, since the creek thaws before the ground does. Negative shifting is caused by the fish habitat structures constructed downstream of the gage and can also be caused by moss growth, which develops throughout the summer and continues until fall when the gage is deactivated for winter. Sixteen measurements (Nos.111 - 126) were made this year ranging in discharge from 6.29 to 289 cfs. The rating is defined to 206 cfs; flows above 309 cfs are to be considered estimated. There were no flows above 309 cfs this water year. Average daily flow was above the highest measurement of 289 cfs on June 2 and 3, 2009. Peak discharge of 314 cfs occurred at 1730 June 2, 2009 at a gage height of 4.15 ft with a shift of -0.33 ft. The peak exceeded measurement No. 120, made on June 3, by 0.06 feet in stage.
Discharge.--	Shifting control method was used all year. Measurements showed shifts ranging from -0.02 to -0.33 ft. Shifts were applied as defined by measurements and distributed with some consideration to stage regarding peak discharge for the year. Shifts were applied as follows: October 1 to November 25, 2008: time proration as defined by measurement Nos. 110-112. April 7 to the peak discharge at 2000 June 2, 2009, stage dependent shifting using variable shift table TARTARCOVST1 which is defined by five measurements (Nos. 116-120) made during the period of use. June 2, 2009 to August 26, 2009: stage dependent shifting using variable shift table TARTARCOVST2 which is defined by five measurements (Nos. 120-125) made during the period of use. August 26 to September 30, 2009: time proration as defined by measurement (Nos. 126-127). All measurements were given full weight except for No. 124, which was adjusted 4% to better fit the variable shift table. .
Special Computations.--	Computed record was used to estimate flows for the period of possible ice effect: November 9-25.
Remarks.--	The record is rated good, except for period of ice effect, which is poor due. This is a partial year record, no record available for November 25 to April 7. However, three discharge measurements were taken at the request of the Division of Wildlife (DOW) while the gage was out of service: No. 113, 6.29 cfs on December 29, 2008; No. 114, 8.3 cfs on February 3, 2009; No. 115, 14.5 cfs on March 11, 2009. Station maintained and record developed by Mike Wild.
Recommendations.--	Federal Highway Commission is planning to replace bridge and gage house in 2010; prepare new rating if project does not proceed in 2010. If project does proceed, gage datum needs to be transferred over to a temporary RM not connected to the old bridge.

STATE OF COLORADO
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TARRYALL CREEK BELOW TARRYALL RESERVOIR

RATING TABLE--

TARTARCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	20	---	---	---	---	---	34	214	136	98	25
2	22	20	---	---	---	---	---	37	296	130	87	24
3	22	21	---	---	---	---	---	38	297	122	71	23
4	23	21	---	---	---	---	---	38	266	125	61	22
5	23	20	---	---	---	---	---	37	227	118	56	22
6	24	16	---	---	---	---	---	37	209	115	51	20
7	23	13	---	---	---	---	---	37	191	113	49	21
8	23	14	---	---	---	---	14	38	178	103	49	23
9	23	14	---	---	---	---	18	43	169	92	45	24
10	22	16	---	---	---	---	22	48	162	84	42	24
11	22	17	---	---	---	---	24	54	156	84	39	22
12	28	17	---	---	---	---	25	61	156	92	36	22
13	40	18	---	---	---	---	23	71	151	103	33	27
14	38	20	---	---	---	---	23	80	148	110	34	41
15	34	15	---	---	---	---	25	92	149	103	37	48
16	30	14	---	---	---	---	25	105	147	92	36	49
17	28	16	---	---	---	---	27	113	139	79	34	42
18	26	19	---	---	---	---	25	113	130	74	34	33
19	26	20	---	---	---	---	23	122	128	74	33	27
20	25	19	---	---	---	---	23	134	132	76	31	25
21	25	16	---	---	---	---	33	137	165	75	29	24
22	25	15	---	---	---	---	45	178	183	79	27	25
23	22	14	---	---	---	---	45	209	164	73	26	26
24	19	14	---	---	---	---	39	210	151	66	26	25
25	22	---	---	---	---	---	35	201	157	63	27	25
26	23	---	---	---	---	---	31	197	217	76	30	25
27	24	---	---	---	---	---	30	224	218	106	30	25
28	24	---	---	---	---	---	32	203	182	100	28	24
29	23	---	---	---	---	---	32	165	165	77	27	23
30	21	---	---	---	---	---	32	155	151	76	26	22
31	21	---	---	---	---	---	---	166	---	103	26	---
TOTAL	773	409	---	---	---	---	651	3377	5398	2919	1258	808
MEAN	24.9	17	---	---	---	---	28.3	109	180	94.2	40.6	26.9
AC-FT	1530	811	---	---	---	---	1290	6700	10710	5790	2500	1600
MAX	40	21	---	---	---	---	45	224	297	136	98	49
MIN	19	13	---	---	---	---	14	34	128	63	26	20

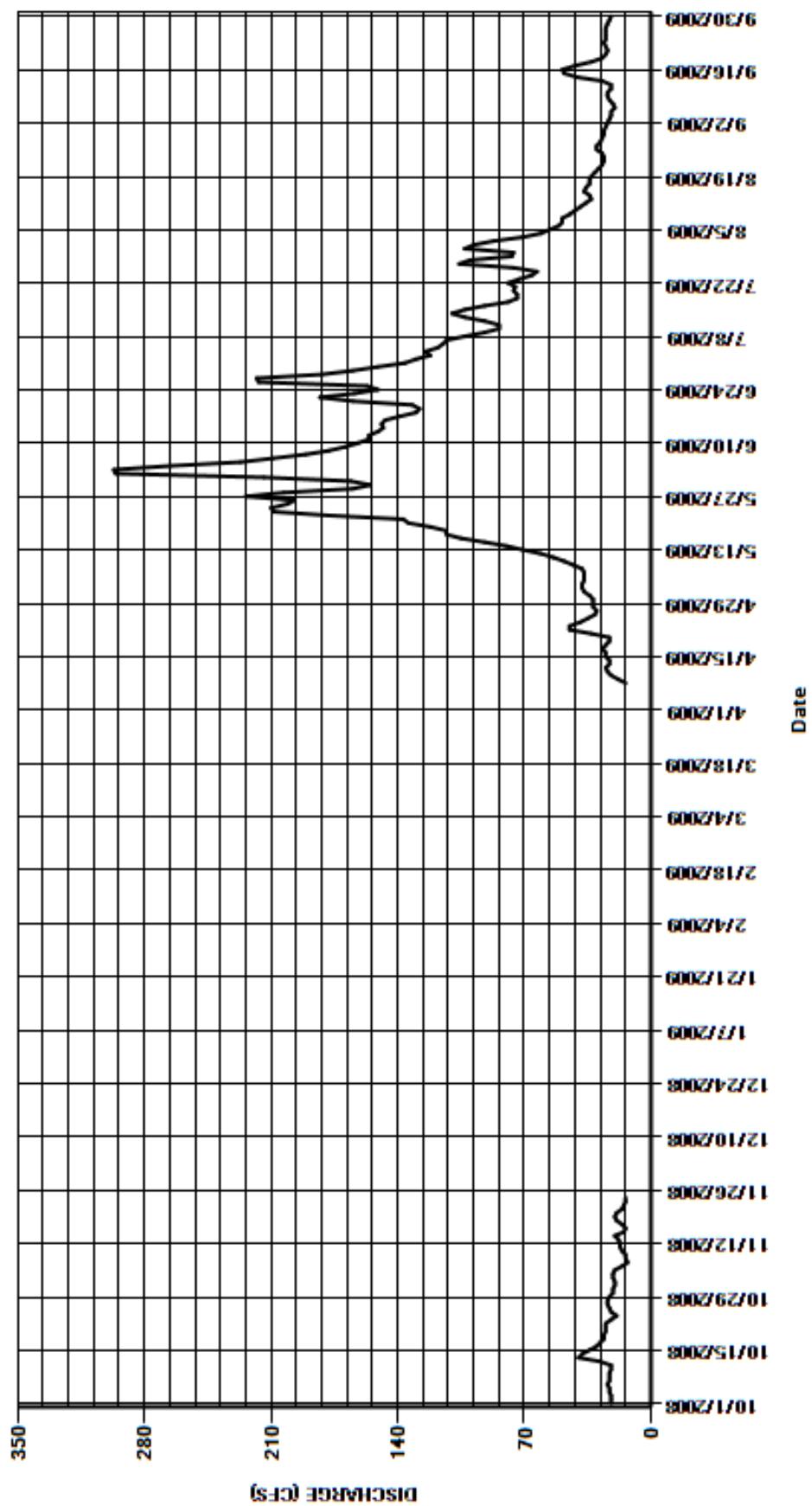
CAL YR	2008	TOTAL	16458	MEAN	69.2	MAX	203	MIN	13	AC-FT	32640	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	15593	MEAN	67.5	MAX	297	MIN	13	AC-FT	30930	(PARTIAL YEAR RECORD)

MAX DISCH: 314 CFS AT 17:30 ON Jun. 02,2009 GH 4.14 FT. SHIFT -0.33 FT.

MAX GH: 4.14 FT. AT 17:30 ON Jun. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

TARRYALL CREEK BELOW TARRYALL RESERVOIR
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR
Water Year 2009

Location.--	Lat. 39°12'33", Long. 105°16'02", in SE 1/4 NW 1/4 sec. 6, T. 10 S., R. 70 W., Jefferson County, Hydrologic Unit 10190002, on left bank 1,400 ft downstream from toe of Cheesman Dam and 3.8 mi southwest of Deckers.
Drainage and Period of Record.--	1,752 mi ² . Oct. 1, 1924-May 13, 1956 at site 370 feet upstream and 0.50 ft. higher. May 14, 1956 to present at current site. Unreliable record from 1909 to 1924 unpublished.
Equipment.--	Graphic water stage recorder and Sutron Satlink2 Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE) in a wooden shelter over a concrete well adjacent to a 30-foot concrete Parshall flume. The chart recorder was replaced with a Sutron Stage Discharge Recorder (SDR) on September 10, 2009. No outside staff gage is present. The station and flume are owned and maintained by the Denver Water Board (DWB). The satellite equipment is owned and maintained by the Division of Water Resources (DWR).
Hydrographic Conditions.--	Cheesman Reservoir is in the center of the 2002 Hayman burn area. The fire severely damaged the watershed and the Denver Water Board has performed extensive erosion control in the area surrounding the reservoir. Major revegetation efforts were performed in the burn area to reduce erosion and water quality problems.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered SE data with chart and SDR data as backup. The DCP suffered various failures of short duration or required maintenance throughout the year which caused the log to be incomplete. Data gaps occurred on: October 1 and 23, 2008; November 6, 7, 15, 16, 26, 2008; Dec 1, 2008; and August 4 -5, 2009. These gaps were filled in with chart data without loss of accuracy. Some interpretation of the exact time was occasionally required with the chart record (due to poorly adjusted clock), but this was accomplished with complete accuracy by bracketing change periods. Twenty-six visits were made to the gage and no SE adjustments were needed. Due to the flume's proximity to the dam, ice accumulation in the approach, flume, and departing sections is not an issue. However, the flume is subject to moss and algal growth. Two flume cleaning corrections were made: -0.01 feet on October 20, 2008, prorated by time as a datum correction from the previous visit (date) when the flume was cleaned; and -0.10 ft on February 24, 2009 addressed by incorporating the correction into shift for the measurement made that day.
Datum Corrections.--	Levels were run on September 10, 2009 and the gage was found to be reading correctly.
Rating.--	The control is a concrete 30-foot Parshall flume with a modified rating. The flume submerges at flows near the 1000 cfs due to constrictions in the channel below the gage. Rating No. 11 was developed in 1995 to compensate for submergence and was continued in use for the current year. Submergence seems to begin when the measurement section velocity reaches around 6.6 ft/s. The rating is well defined except for flows around 1,000 cfs where submergence appears to cause a break point in the slope of the curve. Shifts historically were within a few hundredths of the rating. However as the approach pool has filled, shifts have become more positive. Gravel deposition occurred on the left side of the upstream channel and the flume converging section during a precipitation event on 7/21/2009. The gravel was washed down the access road into the channel above the Parshall flume. Some effort was made to remove the material when the road was repaired; however a large delta remains causing higher velocities from the mid section to right edge of water in the flume. Comparisons of velocities to measurements taken in 1995 show the effects of the approach pool filling with elevated velocities at comparable depths. Using the USBR "Water Measurement Manual", a 30 ft Parshall Flume's range of accurately measuring discharge is 15 to 1500 cfs. Anything above or below this range is outside the +/- 5% accuracy. Given this fact, flows below 15 cfs at gage height 0.38, or above 1500 cfs at gage height of 5.94 the record would be considered fair. All flows in water year 2009 were within the +/- 5% range of accuracy. Twenty three measurements (Nos. 205-227) were made during the water year ranging in discharge from 37.9 to 878 cfs. The flume rating is well defined for the ranges of flow experienced. The peak discharge of 900 cfs occurred at 1630 June 3, 2009 at a gage height of 3.52 ft with a shift of +0.19 ft. It exceeded measurements Nos. 219, 220, made on June 4, 2009, by 0.06 feet in stage.
Discharge.--	Shifting control method was used all year. Negative shifts occur when moss accumulates on the crest of the flume. This was the case for the periods from 10/1/2008 to 2/24/2009 and from 9/2/2009 to 9/30/2009 when moss was noted to affect the stage discharge relationship. Shifts were applied as defined by measurements and distributed by time for this period. For the period from 2/24/2009 to 9/2/2009, variable shift table PLACHECOVST1 was applied with shifts distributed by stage. PLACHECOVST1 was developed from measurements # 212 through # 226 completed during the same period. Measurements 217 abd 223 were adjusted 1% and 2% to better fit the shift curve. Measurements for the entire water year show shifts varying from -0.05 ft. to 0.19 ft.
Special Computations.--	Flume cleaning corrections are handled differently depending on whether the State or DWB perform the cleaning. If the gage height drops as a result of a DWB flume cleaning, it usually occurs between measurements, it is Denver's procedure to increase the release so that the same gage height is maintained. This did not occur this year. If a gage height change occurs when the flume is cleaned by a State Hydrographer, a measurement is made before and after the flume cleaning with shifts applied accordingly.
Remarks.--	The record is considered good. Station maintained and record developed by Mike Wild .
Recommendations.--	Remove gravel from weir pool. Install staff gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR

RATING TABLE--

PLACHECO11 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

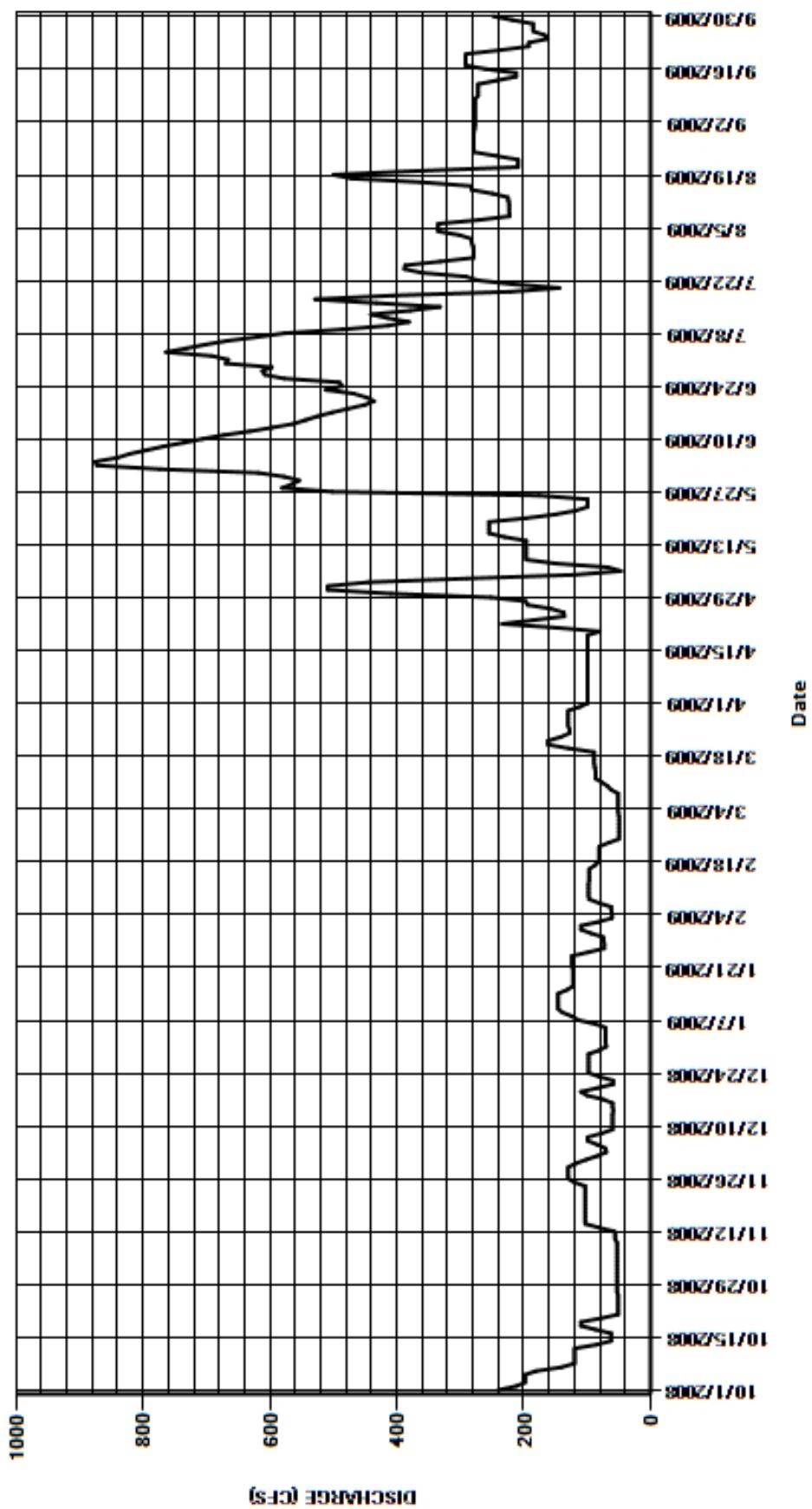
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	240	53	102	71	110	50	99	509	618	666	282	277
2	212	53	84	71	83	50	99	509	774	692	282	277
3	198	53	70	71	61	51	99	446	873	764	301	277
4	198	53	71	71	61	51	99	290	875	732	335	277
5	198	53	84	71	62	51	99	120	841	702	335	277
6	181	53	99	88	62	51	99	47	822	667	335	277
7	141	53	99	114	81	51	99	68	795	620	271	277
8	120	53	77	124	97	51	99	150	768	577	222	277
9	120	53	60	139	98	62	99	196	736	486	223	272
10	120	56	60	146	98	68	99	196	706	414	223	272
11	120	56	60	146	98	77	99	196	673	381	223	272
12	120	57	60	146	98	87	99	196	632	414	224	272
13	85	81	60	146	97	87	99	196	597	441	225	242
14	62	103	59	146	97	87	99	196	563	379	249	212
15	62	103	60	132	97	88	99	230	544	332	282	212
16	62	103	60	122	97	89	99	255	525	432	282	260
17	87	103	75	122	88	89	99	255	502	529	360	292
18	110	103	100	122	82	89	99	255	477	406	471	292
19	110	103	110	122	81	89	99	255	451	221	500	292
20	78	103	84	122	81	129	80	197	436	144	368	291
21	51	103	59	123	81	162	149	150	448	218	209	238
22	51	103	59	124	81	162	234	118	468	272	209	192
23	51	103	81	124	66	142	184	99	512	291	209	192
24	51	103	98	124	50	128	136	99	486	360	244	162
25	51	120	98	98	50	128	137	99	491	388	279	167
26	51	130	98	73	50	130	157	176	578	387	279	185
27	53	130	98	73	50	130	194	502	608	332	279	185
28	53	130	98	74	50	130	197	581	612	279	279	185
29	53	130	98	75	---	130	252	565	597	279	279	218
30	53	118	81	94	---	130	409	554	670	279	279	248
31	53	---	70	110	---	112	---	578	---	280	278	---
TOTAL	3195	2618	2472	3384	2207	2931	4010	8283	18678	13364	8816	7369
MEAN	103	87.3	79.7	109	78.8	94.5	134	267	623	431	284	246
AC-FT	6340	5190	4900	6710	4380	5810	7950	16430	37050	26510	17490	14620
MAX	240	130	110	146	110	162	409	581	875	764	500	292
MIN	51	53	59	71	50	50	80	47	436	144	209	162
CAL YR	2008	TOTAL	79400	MEAN	217	MAX	924	MIN	39	AC-FT	157500	
WTR YR	2009	TOTAL	77327	MEAN	212	MAX	875	MIN	47	AC-FT	153400	

MAX DISCH: 900 CFS AT 16:30 ON Jun. 03,2009 GH 3.52 FT. SHIFT 0.19 FT.

MAX GH: 3.52 FT. AT 16:30 ON Jun. 03,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06701500 SOUTH PLATTE RIVER BELOW CHEESEMAN RESERVOIR
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
NORTH FORK SOUTH PLATTE RIVER AT GRANT
Water Year 2009

Location.--	Lat. 39°27'26", Long. 105°39'29" in NW¼ sec. 10, T.7 S., R.74 W., Park County, Hydrologic Unit 10190002, on left bank at Grant, 1,550 ft downstream from Geneva Creek, and 1.3 mi downstream from east portal of Harold D. Roberts tunnel.
Drainage and Period of Record.--	127 mi ² ; 1948 to present.
Equipment.--	Graphic water stage recorder and satellite monitoring equipment in a wooden shelter over a concrete well at a concrete trapezoidal channel section and spillway. The gage has residential power and is equipped with a heater and a heat lamp to prevent freezing of the stilling well. The station, with the exception of satellite and other recording equipment, is owned and maintained by the Denver Water Department. The satellite equipment is owned by the Office of the State Engineer.
Hydrographic Conditions.--	Pine forest at 8500 ft to 9500 ft. Gage is affected by natural stream flows from Kenosha Creek, Geneva Creek and discharges from the East Portal of the Roberts Tunnel. Rapid changes in stage are caused by the regulation of Roberts Tunnel, ½ mile upstream. When Roberts Tunnel is operating, the gage is typically free from ice.
Gage-Height Record.--	The primary record is hourly averages of 15 minute data taken from satellite monitoring with chart back up. The record is complete and reliable, except for periods when Roberts's Tunnel was off and the gage was affected by ice: November 7, 2008 , March 27, April 17-19, 2009 .
Datum Corrections.--	Levels were last run on August 27, 2008 and the gage was found to be reading within the ±.02 ft. tolerances. No instrument corrections were needed.
Rating.--	The control through all stages up to 4.0 feet is a broad crested weir with slightly raised edges. Flow over control has free getaway and should not become submerged. Both banks are clean p to 5 ft of stage. Channel is straight for 500+ feet upstream and downstream. The streambed leading up to the broad crested weir consists of rock and cobble and is affected by high flows during runoff and releases from Roberts Tunnel. Shifts are caused by scour and fill of the weir pool and by gradual erosion of the control. Rating 12 has been in use since October 1, 2001 and was continued in use for the entire year. It is defined by measurements from 15.6 to about 700 cubic feet per second (cfs.) Fourteen measurements (Nos. 1063 – 1076) were made this year, ranging in discharge from 42 to 426 cfs. Flows outside the range defined by the weir rating did not occur in 2009. The peak flow of 658 cfs occurred at 1930 hrs. May 24, 2009 at a gage height of 1.91 ft. with a shift of -0.02 ft. It exceeded measurement number 1073 made July 20, 2009 by 0.29 ft. in stage.
Discharge.--	Shifting control method was used all year. Shifts were distributed by time from October 1, 2008 to April 22, 2009. Relatively stable gage heights during this period of time, allow for good representation by the shifting control method. Measurements 1063-1069 made during this period varied in unadjusted shifts from -0.01 to +0.03 ft. All measurements were given full weight except for No. 1063 which was adjusted +3% to smooth shift distribution. Stage-dependent shifting was used from April 22, 2009 to September 30, 2009, mainly to properly capture a slight trend toward negative shifts at higher flows. Variable shift tables gave greater consideration to the wide variety of stage within this time period, including the peak flow for the year. Unadjusted shifts during this period varied from -0.02 to +0.01 ft. Two tables were used: Table 1 was used from April 22 (measurement 1069) to July 20 (measurement 1073) and is based of measurement Nos. 1069-1073, made during this period, plus Nos. 1075 & 1077. All were given full weight. Table 2 was used from July 20 (No. 1073) to September 30, 2009. It is based on all measurements made during this period—Nos. 1073-1076—plus measurement 1077 made in 2010. All were given full weight. A hydrograph was used in the development of the shift table and is included.
Special Computations.--	A spreadsheet is used to compute the daily difference between the Grant gage and Roberts Tunnel. This difference represents the native flow in the North Fork without the Roberts Tunnel. Since this flow should follow trends and should never be negative, the calculation is a reality check on the computation of both records. Discharges for all ice days were computed by correcting hourly values using graphic estimates which cut off the ice peaks . These values are estimated from adjacent good record and temperature trends.
Remarks.--	The record is good with the exception of ice periods which are estimated and rated fair. Station maintained and record developed by Patrick Tyler.
Recommendations.--	The Roberts Tunnel and North Fork of the South Platte at Grant record should be worked on a monthly basis.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NORTH FORK SOUTH PLATTE RIVER AT GRANT

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

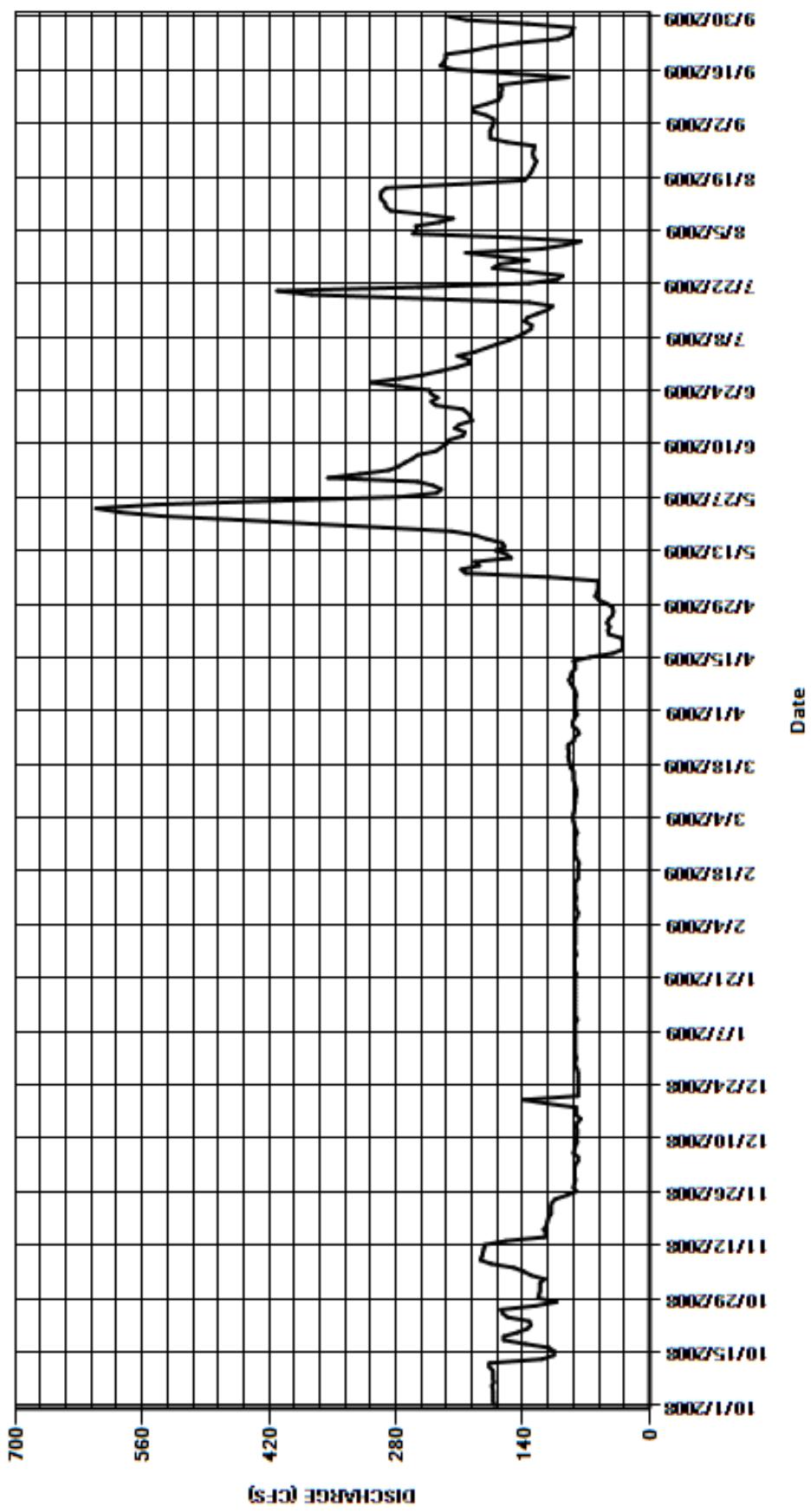
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	171	121	83	82	82	82	82	60	355	199	93	174
2	173	121	83	82	82	83	82	58	320	200	76	172
3	173	116	82	82	82	84	82	57	288	212	154	172
4	173	131	79	82	82	85	82	57	277	193	261	180
5	173	139	79	82	82	84	81	57	270	181	257	195
6	174	150	84	82	80	83	82	111	262	169	258	195
7	172	175	83	82	79	83	84	203	256	156	232	180
8	173	187	82	82	81	82	87	208	236	146	217	167
9	173	185	80	82	82	82	89	188	230	138	246	164
10	173	184	81	80	82	81	87	193	224	131	286	164
11	177	183	80	82	81	81	86	153	221	130	291	163
12	177	182	80	82	82	82	82	158	206	138	292	165
13	119	159	81	82	82	83	82	170	204	135	296	130
14	106	116	80	82	82	84	84	160	215	124	297	90
15	105	114	76	82	82	84	66	163	210	113	296	154
16	111	117	81	82	79	84	41	180	196	107	291	215
17	137	114	81	82	79	87	30	193	198	133	207	231
18	161	113	81	82	79	88	30	218	201	251	138	227
19	161	112	113	82	79	89	30	294	206	373	134	225
20	146	109	139	82	78	90	31	375	236	411	131	225
21	135	109	79	82	80	89	45	455	241	255	129	195
22	131	109	79	81	82	90	46	540	234	133	127	175
23	133	108	79	83	82	90	44	585	241	102	125	145
24	157	104	79	83	83	84	47	611	243	96	128	101
25	162	91	79	83	82	83	45	545	277	134	129	88
26	164	81	79	83	82	78	41	413	308	173	128	86
27	126	84	79	81	82	80	40	277	276	166	127	84
28	103	83	80	82	80	85	41	235	250	134	158	135
29	123	82	82	83	---	85	47	230	231	167	176	202
30	122	83	82	82	---	83	56	239	213	203	176	222
31	121	---	81	82	---	80	---	256	---	120	176	---
TOTAL	4605	3762	2586	2543	2270	2608	1852	7642	7325	5323	6032	5021
MEAN	149	125	83.4	82	81.1	84.1	61.7	247	244	172	195	167
AC-FT	9130	7460	5130	5040	4500	5170	3670	15160	14530	10560	11960	9960
MAX	177	187	139	83	83	90	89	611	355	411	297	231
MIN	103	81	76	80	78	78	30	57	196	96	76	84
CAL YR	2008	TOTAL	67347	MEAN	184	MAX	687	MIN	20	AC-FT	133600	
WTR YR	2009	TOTAL	51569	MEAN	141	MAX	611	MIN	30	AC-FT	102300	

MAX DISCH: 658 CFS AT 19:30 ON May. 24,2009 GH 1.91 FT. SHIFT -0.02 FT.

MAX GH: 1.91 FT. AT 19:30 ON May. 24,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTH FORK SOUTH PLATTE RIVER AT GRANT
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE
Water Year 2009

Location.--	Lat. 39°24'33", Long. 105°10'10", SE 1/4 sec. 25, T.7 S., R.70 W., Jefferson County, Hydrologic Unit 10190002, on left bank at South Platte, 200 ft downstream from bridge on State Highway 75, and 400 ft downstream from North Fork.
Drainage and Period of Record.--	2,579 mi ² ; 1910 to present.
Equipment.--	Sutron Satlink2 Data Collection Platform (DCP) with Sutron 56-0540 shaft encoder, a Stevens type A graphic water stage recorder and a tipping bucket rain gage, in a concrete shelter over a 60-in CMP well, and cableway. The primary gage is an electric tape gage mounted on the equipment shelf. The gage is on Denver Water Board property, and a Denver Water Department (DWD) employee will sometimes visit the gage during high flow events. Satellite equipment is owned and maintained by Division of Water Resources (DWR).
Hydrographic Conditions.--	Flow runs through mountainous terrain and is somewhat controlled by releases from Cheesman Reservoir and Robert's Tunnel. A large portion of the watershed contains significant burn areas due to the Hayman, Schoonover and Buffalo Creek fires. However, soil erosion from these fires is stabilizing and turbidity, though still present, is decreasing. Trees and other organic material migrate down river during heavy precipitation events.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart back up. The primary record agrees with the chart to within +/-0.02 ft. The record is complete and reliable except as follows: October 1, 2008 - 10:15 to 15:30 - Satellite equipment upgraded to Satlink2, data obtained from chart and on site observation; October 28, 2008 - 20:15 to 22:00, data obtained from chart; November 23, 2008 - 08:15 to 09:00, no edits necessary, chart checked; April 18, 2009 - 04:15 to 06:00, data obtained from chart. December 5, 2008 through February 8, 2009, when ice affected the stage-discharge relationship.
Datum Corrections.--	Levels were run on August 27, 2008 and were found to be within the +/-0.02 ft. tolerances. No instrument corrections were made.
Rating.--	The control is a rock channel and bank at medium and high stages. At low flows a slight narrowing of the channel and a rock riffle downstream of the gage act as the control. Channel constriction a quarter mile below the gage may affect extremely high flows. Rating No. 16 (PLASPLCO16) in use since Oct 1, 2002 was continued in use this year. It is defined by measurements to 3350 cfs. Nineteen measurements (Nos. 803-821) were made this year, ranging in discharge from 216 to 1550 cfs. The measurements covered the range of discharge experienced during non-ice record with the exception of the following days when daily average flows were less than 216 cfs: December 3, 4, 2008, February 10-12, Feb 14 through March 19, 2009; and, days of greater daily average flow on June 3, 2009. The peak discharge of 1590 cfs occurred at 0830 June 3, 2009 at a gage height of 4.79 ft with a shift of 0.00 ft. It exceeded measurement No. 815, made June 4, 2009 by 0.05 feet in stage.
Discharge.--	Shifting control method and stage dependent shifting was used for the year with the exception of estimated periods. Shifts were distributed as follows: October 1, 2008 to February 24, 2009, shifts distributed by time. The shift defined by measurement number 802 taken September 11, 2008 was prorated to the start of the water year. The shift defined by measurement number 803 was adjusted 3 % and measurement number 804 by 1 % to provide continuity with the 2009 water year record. February 24, 2009 to peak discharge on June 3, 2009, (08:30) stage dependent shifting with consideration to time using variable shift curve PLASPLCOSC1, based on measurements 808 through 815. The following shifts were adjusted to produce a smooth, realistic shift adjusted rating to account for movement of gravel and sands in the controlling section at the gage: Measurement 803, 3%, 0.08 to 0.05; Measurement 813, 5%, -0.02 to 0.05; Measurement 814, 1%, 0.05 to 0.04. June 3, 2009 to September 30, 2009 stage dependent shifting by using variable shift curve PLASPLCOSC2, based on measurements 815 through 822. This variable shift curve accounts for the changes in the channel following the peak flow on June 3, 2009. Two shifts measurement were adjusted to provide continuity in the shift curve: Measurement 819, 3%, 0.03 to 0.07. Positive and negative shifts are caused by movement of gravel and sand past the gage. Winter ice can also result in shifts at the gage. Measurements show shifts varying from 0.00 to 0.07 ft.
Special Computations.--	The ice-affected record is not always obvious from the chart. Ice periods are identified by comparing computed record against DWB estimates. A mass balance spreadsheet is included in the record. Strontia Dam temperature data from National Oceanic Atmospheric Association (NOAA) was also examined during periods of below freezing temperatures. Generally the computed record will start to greatly exceed the DWB figures shortly after severe winter cold sets in, and ice record will be considered to begin. The computed figures will remain high until sustained warm weather. When gage figures and DWB figures get close again, ice effect assumed to be over. Usually around December, the computed flows start becoming markedly higher than the Strontia estimates. In February or March the computed daily flows will drop until they again have reasonable agreement with the Strontia computed inflows.
Remarks.--	The record is good, except for periods of ice affected record, which are estimated and poor. Station maintained and record developed by Mike Wild.
Recommendations.--	Winter measurements and visits should continue to be made in order to better determine the ice affected days. Measurements should also continue to be made twice a month as conditions allow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE

RATING TABLE--

PLASPLCO16 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

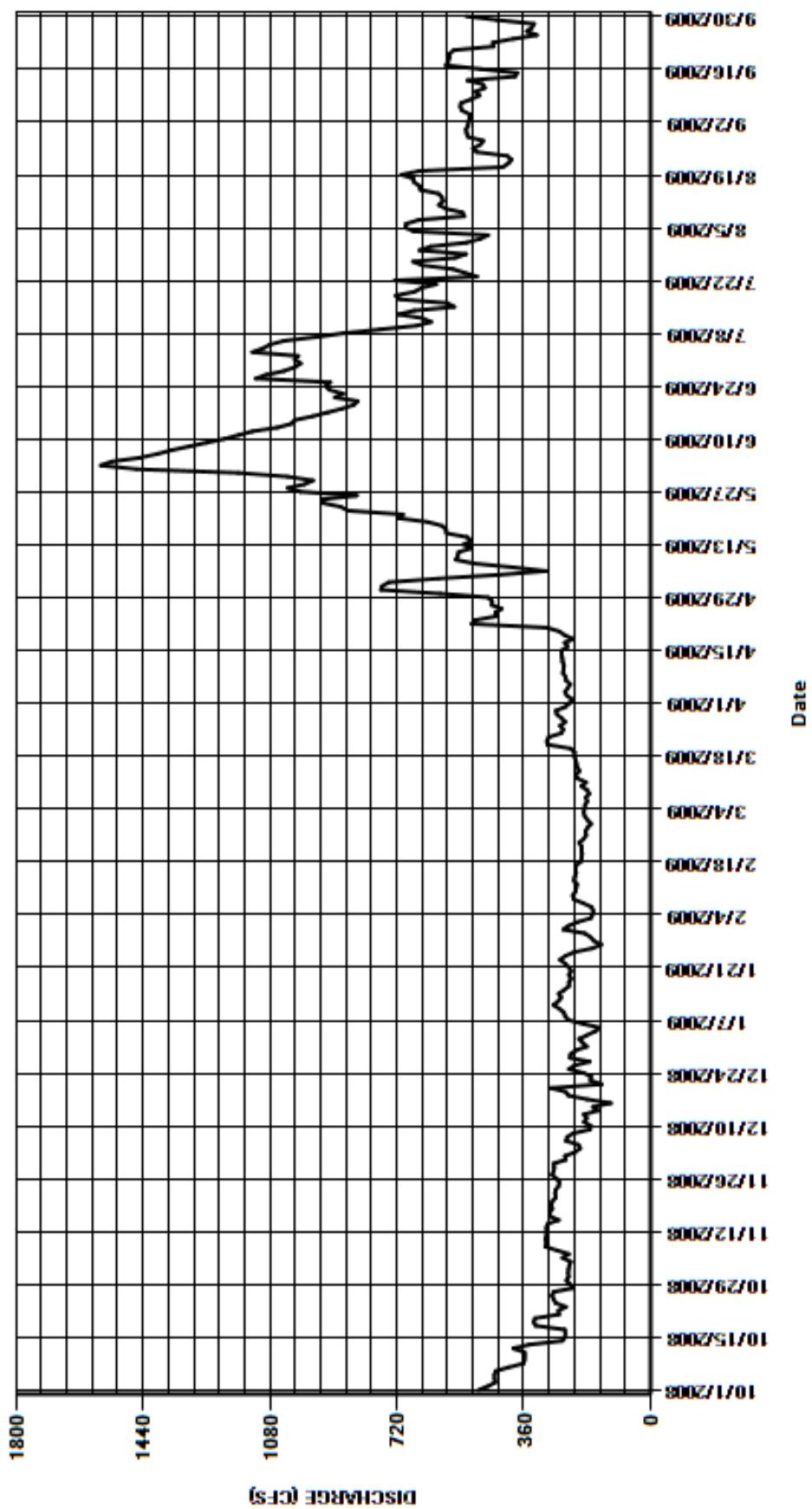
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	488	234	241	193	233	179	230	765	1170	1010	523	518
2	461	233	243	203	207	187	223	762	1460	1000	484	517
3	441	231	215	181	170	190	238	743	1560	1130	461	514
4	443	227	200	158	165	188	243	602	1530	1100	672	513
5	443	250	205	144	163	186	235	431	1450	1080	696	535
6	440	232	240	191	168	180	228	297	1400	1040	694	540
7	403	266	237	233	192	184	240	392	1360	949	659	538
8	361	299	220	243	218	174	242	502	1310	871	529	509
9	358	296	172	246	221	181	249	553	1260	768	534	486
10	357	299	170	259	214	197	247	547	1210	664	581	497
11	358	295	189	276	212	183	246	545	1170	623	601	471
12	390	295	181	262	209	207	250	509	1130	648	589	477
13	345	296	190	254	218	213	251	531	1060	716	592	520
14	251	292	150	261	215	202	253	509	1020	671	602	385
15	243	261	164	245	212	208	252	521	1010	557	653	379
16	242	285	113	232	213	211	235	579	959	577	656	482
17	244	287	180	232	212	213	244	581	917	712	671	581
18	326	279	233	226	198	217	220	592	876	723	674	575
19	332	282	241	232	196	216	244	633	843	670	708	571
20	328	279	283	226	195	228	259	715	831	650	656	571
21	260	269	139	232	196	293	295	703	896	608	420	559
22	262	271	171	243	196	294	508	859	873	726	404	446
23	240	270	169	257	203	289	497	879	912	493	395	448
24	269	261	190	242	190	254	439	929	922	527	407	390
25	275	259	232	217	183	248	441	930	909	561	493	323
26	280	267	216	166	185	257	423	834	1120	648	504	351
27	275	280	173	140	179	242	451	994	1090	674	483	337
28	220	275	229	161	169	253	450	1030	1040	555	475	331
29	229	274	227	171	---	266	461	982	1010	524	518	436
30	239	275	212	187	---	269	597	958	993	656	522	523
31	233	---	181	248	---	242	---	1030	---	624	524	---
TOTAL	10036	8119	6206	6761	5532	6851	9391	21437	33291	22755	17380	14323
MEAN	324	271	200	218	198	221	313	692	1110	734	561	477
AC-FT	19910	16100	12310	13410	10970	13590	18630	42520	66030	45130	34470	28410
MAX	488	299	283	276	233	294	597	1030	1560	1130	708	581
MIN	220	227	113	140	163	174	220	297	831	493	395	323
CAL YR	2008	TOTAL	176581	MEAN	482	MAX	1280	MIN	113	AC-FT	350200	
WTR YR	2009	TOTAL	162082	MEAN	444	MAX	1560	MIN	113	AC-FT	321500	

MAX DISCH: 1590 CFS AT 08:30 ON Jun. 03,2009 GH 4.79 FT. SHIFT 0 FT.

MAX GH: 4.79 FT. AT 08:30 ON Jun. 03,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
Water Year 2009

Location.-- Lat. 39°26'00", Long. 105°07'30", SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, T.7 S., R.69 W., Douglas County, on right bank 1/4 mi downstream from Strontia Springs Dam.

Drainage and Period of Record.-- 2596 sq mi. 1983 to present.

Equipment.-- Graphic water stage recorder, satellite monitoring data collection platform with digital shaft encoder installed in a formed concrete shelter and well. An adjustable reference point with a graduated tape on the float drive for the recorder is used for referencing. An adjustable reference for a drop tape is located below the floor hatch to the well. An outside staff gage is used as an additional reference. The gage and well are one-piece cast concrete, set on bedrock. A cableway for high flow measurements is located 100 ft downstream of the gage.

Hydrographic Conditions.-- The flow is controlled by reservoir releases most of the time, including flows released from further upstream at Cheeseman Reservoir and Robert's Tunnel. The flows will reflect extreme basin conditions when the reservoirs are very low or completely full. Strontia Dam is approximately 1500 feet upstream. The record usually runs in steps from the releases. A period of free river occurred in June this year during which Strontia gates were closed and the reservoir spilled all inflow.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data. Chart data are used for backup. Record is complete and reliable. The encoder maintained calibration so that no corrections were necessary to the record.

Datum Corrections.-- In the past, it was believed that since the gage is cast on bedrock, no RP to BM checks were needed because the most stable BM sites would be all attached to the gage. Levels were run this year, and three reference marks were established. No corrections were made.

Rating.-- The control is a boulder and cobble riffle channel. The grade drops approximately 170 feet below the gage (just below the cableway). The riffle below the cableway is considered to be the major control for flows under approximately 800 cfs. At flows above approximately 800 cfs the entire channel becomes the control. Rating No. 4, dated March 19, 2008 was continued for 2009. It is defined by measurements to 1670 cfs. Frequent measurements at high flows are needed since the channel does change, but additional measurements are particularly desirable around 1000 cfs, as computed flows in this range sometimes do not balance well with downstream gages. Sixteen measurements (441-456) were made ranging in flow from 34.9 cfs to 914 cfs. They cover the range in discharge except for lower daily flows on December 3-17, 19, 21-22, and higher daily flows on June 2-10. The peak flow of 1430 cfs occurred at 1200 on June 3, 2009 at a gage height of 5.72 ft. with a shift of -0.02 ft. It exceeded the stage of high measurement No.451 (made June 10, 2009) by 0.56 ft.

Discharge.-- Shifting control method was used all year. Shifts at low and medium flows are caused by scour and fill through the section control below the gage. High flow shifts are influenced by downstream channel gradients and impedance factors. Measurements showed raw shifts ranging from -0.03 to +0.08 feet. Shifts were distributed by time the entire water year with consideration of stage changes during these periods: November 24 (#444) to January 21 (#445), April 7 (#448) to April 29 (#449), August 4 (#454) to August 31 (#455) . Stage changes occurred due to changes in release rates from the reservoir, and flushing of Strontia reservoir. Measurements 442, and 447 were discounted -2% and +3% to smooth shift distribution. Measurement 445 was essentially not used. More water was measured than Denver was thought to be releasing, so a check measurement (446) was made immediately. The check showed 13% less water so this second measurement (446) was used. Snow and ice were melting between the gage and the measurement section, so the first measurement was thought to reflect some transient condition. Using our current HydroApp measurement software, it was simpler to adjust measurement 445 a -13% to the measurement 446 shift than it was to delete measurement 445.

Special Computations.-- No ice was observed at the gage this year, as it was a generally warm year. Strontia typically releases constant amounts for long periods of time and this helped to confirm the record. Also, the Strontia reports show max/min temperatures just below their Strontia Outflow numbers and this spares the need to examine the chart closely. We just look for cold days during periods of constant release when our figures are higher than theirs.

Remarks.-- The record is considered good. Station maintained by and record developed by Jana Ash.

Recommendations.-- The Strontia—Chatfield gages need to be measured with the highest possible accuracy. Otherwise the shifts can cause bad water balances and lots of complaints. These gages need to be operated by very experienced personnel who are familiar with stage-shift relationships and the diversion flows that are balanced by the gage figures. The description needs a photo showing the float tape and indicator as the primary reference.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS

RATING TABLE--

PLASTRC004 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

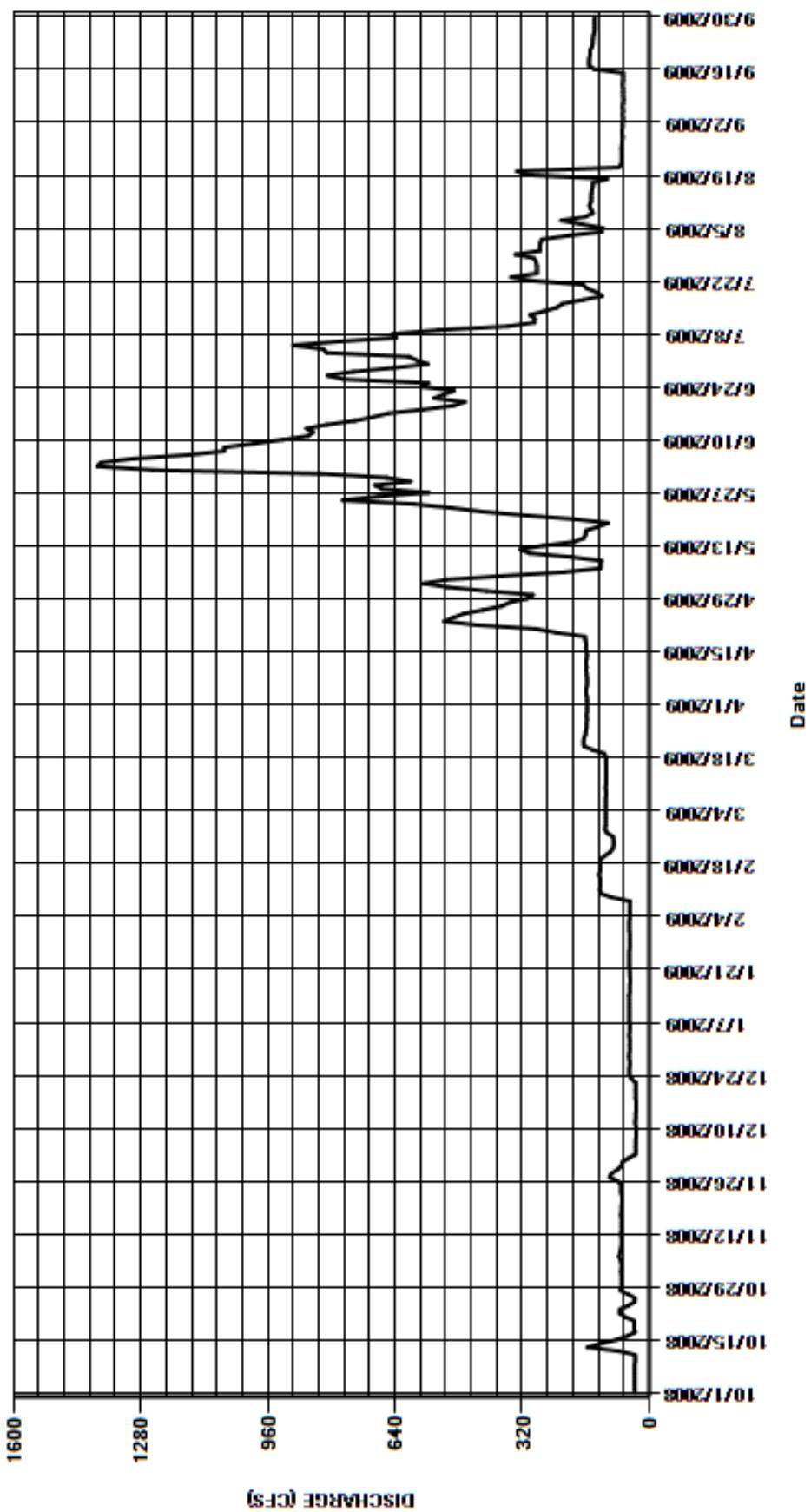
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	70	68	50	50	110	157	410	825	585	274	67
2	37	71	53	49	50	110	157	507	1250	606	271	67
3	37	70	35	50	50	110	157	568	1390	812	203	66
4	37	70	34	50	49	110	159	511	1380	821	120	67
5	37	72	35	49	49	110	159	370	1300	897	117	66
6	37	76	34	49	49	110	157	216	1160	781	170	67
7	37	74	34	50	49	110	157	123	1070	637	222	66
8	37	71	33	50	49	109	157	123	1070	646	160	65
9	36	70	33	50	95	109	158	121	996	531	142	66
10	36	69	33	50	122	110	159	198	923	356	147	66
11	36	70	35	50	125	109	158	302	859	289	151	66
12	77	71	35	50	124	109	160	325	846	288	146	67
13	156	70	34	50	124	109	158	266	863	301	146	66
14	123	70	34	51	124	109	157	189	812	265	146	66
15	82	70	33	49	127	109	158	165	742	232	145	66
16	55	70	33	49	124	109	160	160	695	219	142	139
17	36	71	33	49	124	109	159	160	657	167	142	152
18	38	70	35	48	124	109	161	129	570	119	106	152
19	38	70	34	49	124	113	162	104	494	132	303	151
20	38	69	35	49	112	143	234	187	464	157	333	149
21	61	68	34	50	98	165	286	310	542	167	77	149
22	75	69	34	50	91	166	433	420	517	289	70	144
23	75	71	45	50	90	165	516	499	492	348	69	142
24	54	71	50	50	90	161	493	593	572	283	69	142
25	37	71	50	50	91	160	467	772	556	283	69	141
26	36	80	50	50	106	158	418	682	770	283	70	138
27	53	100	49	49	112	158	372	555	810	285	69	138
28	73	95	50	49	110	157	351	673	745	290	68	138
29	70	80	51	49	---	158	308	691	643	337	67	138
30	70	70	50	49	---	157	293	601	557	275	68	138
31	70	---	49	50	---	157	---	661	---	276	68	---
TOTAL	1721	2189	1245	1537	2632	3988	7181	11591	24570	11957	4350	3145
MEAN	55.5	73	40.2	49.6	94	129	239	374	819	386	140	105
AC-FT	3410	4340	2470	3050	5220	7910	14240	22990	48730	23720	8630	6240
MAX	156	100	68	51	127	166	516	772	1390	897	333	152
MIN	36	68	33	48	49	109	157	104	464	119	67	65
CAL YR	2008	TOTAL	88844	MEAN	243	MAX	983	MIN	33	AC-FT	176200	
WTR YR	2009	TOTAL	76106	MEAN	209	MAX	1390	MIN	33	AC-FT	151000	

MAX DISCH: 1430 CFS AT 12:00 ON Jun. 03,2009 GH 5.72 FT. SHIFT -0.02 FT.

MAX GH: 5.72 FT. AT 12:00 ON Jun. 03,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06708000 SOUTH PLATTE RIVER AT WATERTON
Water Year 2009

Location.--	Lat. 39°29'18", Long. 105°05'32", in NE $\frac{1}{4}$ sec. 34, T.6 S., R.69 W., Jefferson County, Hydrologic Unit 10190002, on left bank 168 ft downstream from bridge on State Highway 221, 0.4 mi south of Waterton, 4.7 mi west of Louviers, and 6 mi upstream from Plum Creek.
Drainage and Period of Record.--	2,621 mi ² ; 1926 to present.
Equipment.--	Graphic stage recorder, and satellite monitoring DCP and shaft encoder in a 54-inch galvanized, corrugated steel shelter and well. The primary reference is an electric drop tape. The gage has power and is equipped with heat lamps to prevent the well from freezing. The gage is owned and maintained by Denver Water Department. The gage is connected to the stream by 2 inlets with flush valves and risers. One of the risers is partially plugged. There is an outside gage that is no longer functional. A bank operated cableway located just upstream of the gage is used for high flow measurements using conventional current meter measurements as well as to pull the ADCP unit across the channel.
Hydrographic Conditions.--	A natural-flow hydrograph is not observed except during periods of extended high runoff when upstream reservoirs are all full. Flow is completely regulated at other times. Between Strontia Springs reservoir and the Waterton gage, Denver Water Department can divert water through Conduit 20, the Highline Canal and the Last Chance Ditch. The Last Chance diversion was new in the 2003 water year. In prior years Denver attempted to maintain a winter flow at Waterton of 30 cfs, but the use of the Last Chance diversion allows Denver's minimum streamflow at Waterton to drop to 15 cfs. This resulted in lower stream flows than have been historically seen at this gage. With the Last Chance ditch running, the FERC minimum streamflow is 15 cfs between September 16 and May 14, and 45 cfs. between May 15 and September 15.
Gage-Height Record.--	The primary record is hourly averages of 15 min data taken from satellite monitoring with chart back up. The record is complete. Missing satellite data on October 9-17, 2008 were filled in with chart data with no loss of accuracy. Record is reliable except for the following periods of ice affect: December 15, 2008 to February 21, 2009; March 26-27, 2009. Some days were estimated, but for the majority of the time, computed record was used. During the period: February 21—March 3, the record had possible ice affect but computed record was used.
Datum Corrections.--	The levels history indicates that the gage shelter settled 0.03-0.04 ft. sometime between 1998 and 2006, and has been relatively stable since then. Levels were last run to the inside gage on September 23, 2009, using R.M. No. 7 as base. The correction indicated of +0.04 ft was achieved by a one-time reset of the elevations of the benchmarks. This fresh start preserved the current rating, and will allow a smooth transition for any future datum corrections
Rating.--	The control is a broad crested weir formed by a pipeline crossing approximately 35 feet below the gage. Rating No. 10, developed in 2007 was used all water year. Rating number 10 is well developed from about 13 to 2000 cfs. Shifts are caused by moss growth on the control and by the amount of stilling of approach velocities provided by the pool behind the control. Fifteen measurements (Nos. 914-928) were made this water year ranging in discharge from 17.2 cfs to 872 cfs. They cover the range in discharge experienced, except for lower daily flows of Dec. 4, 7-8, 11-14, 30-31; Jan. 1-4, 8-10, 12, 14-15; Feb. 5-6; March 31 and April 7-8 and the higher daily flows on June 2-9. The peak flow of 1260 cfs occurred at 0945 June 3, 2009 at a gage height of 2.51 ft with a shift of -0.03 ft. It exceeded high measurement No. 922, made on June 10, by 0.39 feet in stage.
Discharge.--	Shifting control method was used. Shifts were prorated by time with consideration with stage. This year's measurements show raw shifts varying between -0.03 and 0.02 feet. Shifts were analyzed and the relationship between stage and gage height correlated very well with time and changes in stage. Shifts between measurements #923 (June 25) and #924 (July 17) were held for stage.
Special Computations.--	Estimated flows for the Waterton gage were developed from a mass balance spreadsheet. Discharges were used for South Platte River below Strontia Springs Reservoir, with columns subtracted for Denver's diversions to Conduit 20, the Last Chance Ditch, and the Highline Canal. Denver's diversions were available on from their monthly East Slope accounting spreadsheets, using the sheet tab "WT"—"Water Distribution in the South Platte Canyon". These spreadsheet estimates should be used with caution, since Denver's accounting is based on 8am to 7am rather than calendar day figures like Strontia release. Discharge for the periods of ice affect and possible ice affect were taken from computed record, except for the following days which were estimated using a mass balance spreadsheet: December 15 to January 16; January 28-30; February 15, 16; March 26, 27. Computed record for these days diverged greatly from spreadsheet estimates, so the spreadsheet was used as a basis for estimates. Other ice-period days used computed record because there was general agreement with spreadsheet estimates. The crest of the control usually stays open, but the channel often freezes over, and it is very hard to tell from inspection of the gage height record how much ice is affecting the control. Visit notes, chart inspection, temperature data and the Denver Water Spreadsheets were used to determine ice effects. Without visit notes it is difficult to distinguish between ice effect at the gage and diurnal flow due to ice melting in the canyon. Also, ice affect can occur during a warm-up due to floating ice jamming on the control.
Remarks.--	The record is rated good, except periods of ice effect which are estimated and poor. The period February 22 to March 3 is considered fair. Station maintained and record developed by Jana Ash.
Recommendations.--	The chart recorder should be watched closely. The channel and control should be cleared of ice during warm periods in the winter.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06708000 SOUTH PLATTE RIVER AT WATERTON

RATING TABLE--

PLAWATCO10 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	34	19	15	36	22	18	124	857	514	219	63
2	33	35	25	15	35	20	18	197	1140	521	219	63
3	33	34	18	15	27	20	18	243	1230	755	170	63
4	33	33	16	16	18	20	19	204	1200	762	72	63
5	33	34	23	16	17	20	20	103	1150	839	74	62
6	34	33	18	16	17	20	18	60	1060	751	156	63
7	33	35	16	16	20	21	17	36	976	594	200	63
8	33	36	16	16	19	20	17	37	962	603	96	62
9	33	36	18	16	36	20	18	35	910	497	72	62
10	34	35	20	16	39	20	19	54	856	216	73	62
11	35	35	17	17	28	21	19	69	799	90	80	62
12	88	36	17	17	26	20	21	77	792	84	74	63
13	154	34	16	17	32	20	20	92	819	98	73	62
14	128	35	16	17	29	20	18	68	776	91	73	61
15	84	35	19	17	30	20	18	70	713	85	72	60
16	59	34	19	17	30	20	20	68	664	86	69	49
17	32	28	19	18	30	20	27	64	624	96	68	47
18	34	20	19	19	28	19	31	71	529	83	77	45
19	34	19	19	22	28	23	30	70	443	77	282	45
20	37	20	19	32	31	27	66	133	404	77	341	43
21	39	20	19	33	31	24	91	256	480	78	90	37
22	39	20	19	35	26	24	110	359	458	267	71	27
23	38	21	19	35	22	24	154	442	420	368	65	25
24	40	21	19	33	20	20	140	536	501	276	65	24
25	33	21	19	40	24	19	116	748	464	277	64	23
26	33	22	19	42	27	19	83	694	681	276	66	20
27	35	21	18	42	24	19	60	529	729	280	65	20
28	38	18	18	40	22	18	63	650	670	283	63	27
29	34	21	18	40	---	18	53	715	573	335	64	35
30	34	22	18	40	---	19	57	599	471	273	64	32
31	34	---	16	39	---	15	---	673	---	250	64	---
TOTAL	1414	848	571	769	752	632	1379	8076	22351	9882	3301	1433
MEAN	45.6	28.3	18.4	24.8	26.9	20.4	46	261	745	319	106	47.8
AC-FT	2800	1680	1130	1530	1490	1250	2740	16020	44330	19600	6550	2840
MAX	154	36	25	42	39	27	154	748	1230	839	341	63
MIN	32	18	16	15	17	15	17	35	404	77	63	20

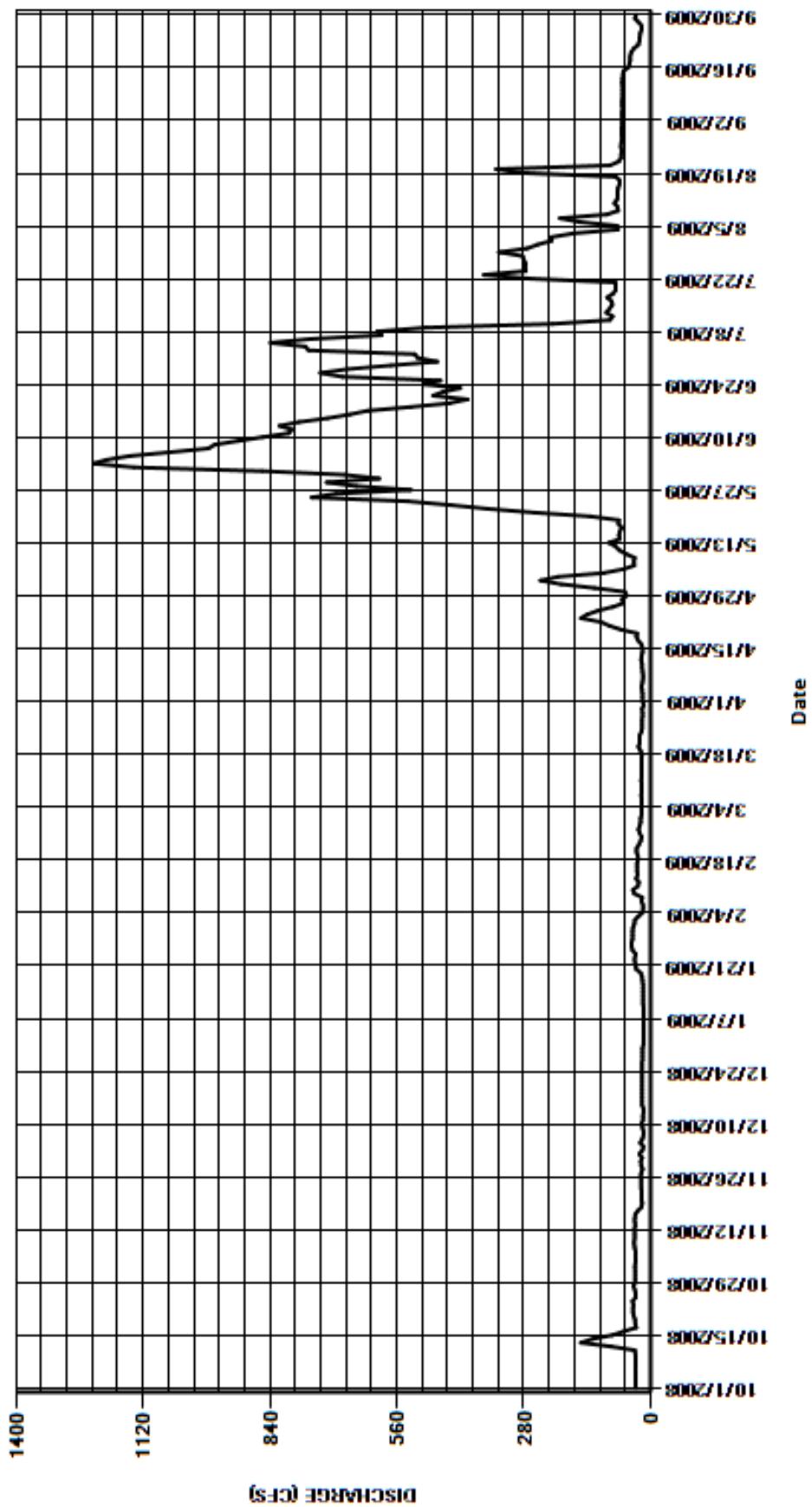
CAL YR	2008	TOTAL	53285	MEAN	146	MAX	802	MIN	16	AC-FT	105700
WTR YR	2009	TOTAL	51408	MEAN	141	MAX	1230	MIN	15	AC-FT	102000

MAX DISCH: 1260 CFS AT 09:45 ON Jun. 03,2009 GH 2.51 FT. SHIFT -0.03 FT.

MAX GH: 2.51 FT. AT 09:45 ON Jun. 03,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06708000 SOUTH PLATTE RIVER AT WATERTON
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
Water Year 2009

Location.-- Lat. 39°33'45", Long. 105°03'35", SE ¼, sec. 1, T.6 S., R.69 W., Jefferson County, Hydrologic Unit 10190002.

Drainage and Period of Record.-- 3,018 mi². 1985 to present.

Equipment.-- Graphic water stage recorder and satellite monitoring DCP and shaft encoder in a formed concrete well and shelter. The DCP is owned and maintained by the DWR. An electric drop tape is used for referencing. There is no outside reference. A cableway for high flow measurement is located just upstream of the gage.

Hydrographic Conditions.-- Native flow is regulated by Chatfield Reservoir, as well as by many reservoirs further upstream. Releases from Chatfield during flood events are regulated to limit the total flow at the Henderson gage (downstream from Denver) to 5000 cfs. There are no minimum streamflow requirements for Chatfield releases. On many days the reservoir outlets are completely closed and flow at the gage consists of tiny amounts of seepage or gate leakage.

Gage-Height Record.-- The primary record is hourly averages of 15 minute satellite data with chart back up. The record is complete and reliable. Daily max and min values agreed with the corrected chart values to within +0.02 foot. One (+.01 ft) correction to the encoder data was applied.

Datum Corrections.-- Levels were run on Sept. 23, 2009 using RM No. 1, and showed the new elevation of the RP to be 0.12 ft higher, at 20.09 ft, which was also the case for levels run July 26, 2006. No corrections were made, as shifts are close to zero. Investigation needs to be done to determine if the 20.09 ft reference elevation needs to be updated.

Rating.-- The control is a large sloped concrete dam approximately 50 feet below the gage, with a stilling basin that is about 1000 ft. long back to the outlet pipe. Aside from some possible negative shifts due to anchor-type moss at low flows, very little should affect the rating for this structure. Unfortunately, measurement conditions near the gage are not good. The channel is very rocky and flow is deep and often extremely slow. The initial and subsequent ratings have incorporated a lot of scatter in the measurements. Variations in shifts seen since 1987 are probably more due to measurement error than to conditions affecting the control. In November of 2007, the gage pool was drained and rocks under the cableway measurement section were removed for a more consistent measurement section. At this time a pzf was observed to be 0.27 ft. A small degree of systematic rating error due to stage-shifts is also likely to still exist in the current Rating No. 3. If enough measurements are made with the highest possible precision, it should be possible to develop a table that does not require shifts. Once such a table is established, it would be better not to measure the gage at all unless the measurements are done with roughly twice as many sections as normal and with the best possible meters. Rating No. 3 was continued in use this year and is well defined to 2500 cfs. Thirteen measurements (No. 390-402) were made this year, ranging in discharge from 25.0 to 1760 cfs. These measurements contain the range in flow with exception of low flow days on Oct. 1, 2008-Jan. 8, 2009; Jan. 21-Feb. 23; March 3-10, 14-26, 31; April 1-3, 9-16; May 26-27, Aug. 25-26; Sept. 2-13, 27-30 and high flow days of June 4-5. The peak flow of 2060 cfs occurred at 1300 June 4, 2009 at a gage height of 5.13 ft. with a shift of 0.00 ft. It exceeded the stage of measurement no. 395 made June 4, 2009 by 0.27 ft.

Discharge.-- Shifting control method was used all year. However, the control is a fairly massive structure and if kept clean of moss would have no source for shifting. The main source of shifts at this gage is very likely to be measurement error. This year's measurements show shifts ranging from -0.01 ft to 0.00 ft. Shifts were distributed by stage using one stage shift table, PLACHACOSC1, for the entire 2009 water year. The depths for measurement #395 were adjusted because it was discovered the meter was in the wrong hole when making the cable measurement. This measurement was downgraded to fair. All measurements were given full weight with exception of measurements 390, 396, 401 and 402 which were adjusted slightly to match surrounding shifts.

Special Computations.-- None.

Remarks.-- The record is good. Station maintained and record developed by Jana Ash.

Recommendations.-- Work should continue on getting a flushing system working at the gage, now that flush water is available from the last chance ditch pipeline. Pro-active measures should be taken with regard to shift variations at high flow: A submergence staff should be installed below the control to check that high flow measurements are not encountering backwater. Cableway markings should be verified using a tagline at water level and a horizontal tape strung between the A-Frames. Additionally, levels should be run to confirm elevations of the RM's and PZF, and reconcile any tape length problem.

STATE OF COLORADO
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SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR

RATING TABLE--

PLACHACO03 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

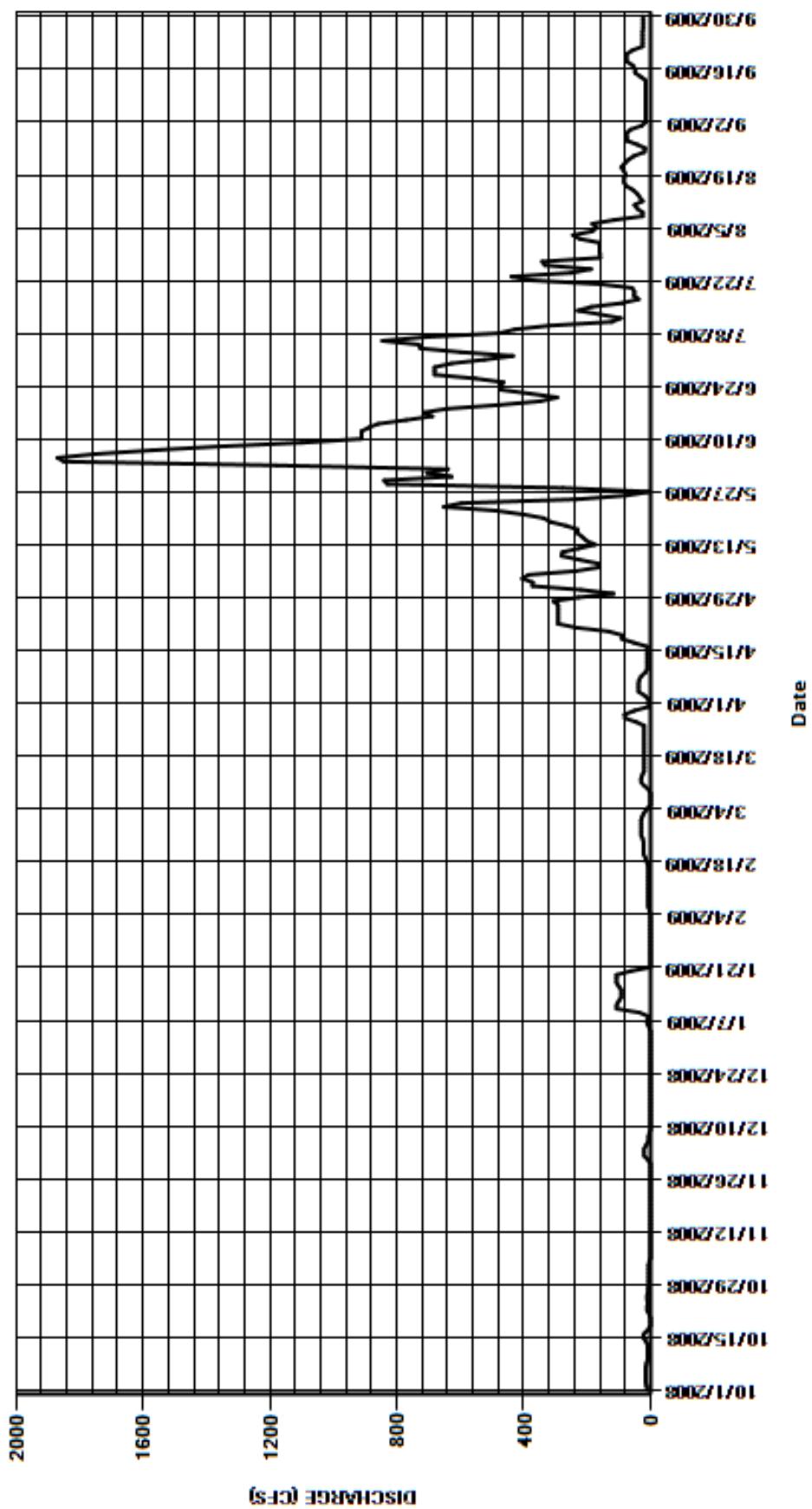
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	6.5	9	0.17	0.79	30	7.1	219	705	524	161	28
2	13	6.5	20	0.15	0.79	26	7.1	372	639	434	223	15
3	16	6.5	20	0.17	0.77	20	19	372	1180	598	245	16
4	16	4.3	20	0.19	0.7	11	38	405	1850	726	184	16
5	16	0.2	13	4.4	3.1	0.1	38	385	1870	731	170	16
6	16	0.19	7.1	11	7.6	0.12	38	235	1750	846	184	16
7	16	0.19	7.1	11	7.8	0.12	37	161	1570	708	116	16
8	13	0.17	4.3	6.9	7.8	0.13	31	167	1360	478	25	16
9	10	0.19	0.27	36	7.7	5.4	18	226	1100	429	25	16
10	10	0.19	0.24	107	7.7	19	11	281	912	320	42	16
11	10	0.19	0.25	107	7.8	30	11	278	912	123	51	16
12	10	0.19	0.25	101	7.8	30	11	226	912	94	25	16
13	10	0.14	0.23	93	7.8	26	11	175	889	160	34	16
14	16	0.15	0.19	93	7.6	20	11	202	859	229	43	32
15	24	0.15	0.19	93	7.5	20	11	215	771	187	56	49
16	20	0.15	0.19	101	7.4	20	11	230	688	89	77	49
17	7.6	0.16	0.19	108	9	20	53	230	717	38	84	57
18	0.64	0.13	0.19	108	12	20	90	267	641	53	84	75
19	0.6	0.13	0.19	108	17	20	90	315	478	51	78	75
20	0.6	0.15	0.19	62	22	20	133	337	347	58	84	75
21	4.2	0.16	0.19	0.8	22	20	235	402	295	157	93	57
22	11	0.15	0.19	0.79	22	20	292	488	380	372	82	25
23	11	0.13	0.19	0.79	22	20	291	652	471	439	70	25
24	9.4	0.13	0.19	0.79	25	20	291	595	473	250	52	25
25	11	0.13	0.19	0.79	30	20	291	232	464	188	20	25
26	11	0.13	0.19	0.85	30	20	291	78	553	333	17	25
27	8.3	0.14	0.19	0.88	30	46	292	1.2	681	342	42	24
28	7.8	0.2	0.19	0.85	30	81	307	277	681	159	74	24
29	7	0.2	0.19	0.8	---	82	228	830	681	160	75	24
30	6.8	0.23	0.19	0.79	---	51	117	840	628	161	75	24
31	6.6	---	0.18	0.79	---	7.1	---	627	---	161	63	---
TOTAL	329.54	28.07	105.15	1159.90	361.65	724.97	3311.2	10320.2	25457	9598	2654	909
MEAN	10.6	0.94	3.39	37.4	12.9	23.4	110	333	849	310	85.6	30.3
AC-FT	654	56	209	2300	717	1440	6570	20470	50490	19040	5260	1800
MAX	24	6.5	20	108	30	82	307	840	1870	846	245	75
MIN	0.6	0.13	0.18	0.15	0.7	0.1	7.1	1.2	295	38	17	15
CAL YR	2008	TOTAL	44573.20	MEAN	122	MAX	592	MIN	0.04	AC-FT	88410	
WTR YR	2009	TOTAL	54958.68	MEAN	151	MAX	1870	MIN	0.1	AC-FT	109000	

MAX DISCH: 2060 CFS AT 13:00 ON Jun. 04,2009 GH 5.13 FT. SHIFT 0 FT.

MAX GH: 5.13 FT. AT 13:00 ON Jun. 04,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06710500 BEAR CREEK AT MORRISON
Water Year 2009

Location.--	Lat. 39°39'11", Long. 105°11'42, in SE 1/4 SW 1/4 sec. 35, T.4 S., R.70 W., Jefferson County, Hydrologic Unit 10190002, on left bank at Morrison, 180 ft upstream from bridge on State Highway 8 and 0.2 mi upstream from Mount Vernon Creek.
Drainage and Period of Record.--	164 mi ² . Sporadic, incomplete data Sep. 1881 to Feb. 1902. Good data October 1919 to current year. Monthly data for some periods only. Some early years published as near Morrison, at Starbuck, at Idledale.
Equipment.--	Graphic stage recorder and satellite monitoring DCP with telephone access in a 60-inch metal shelter and 48 inch well. The float for the encoder resides inside a cylinder tube containing Isopar (an anti-freezing agent). The back-up chart recorder float is in the well itself and prone to freezing. A drop tape within the well referenced to an adjustable RP on the instrument shelf is the primary reference gage. There is no outside gage. Control is a compound weir. A bank-operated cableway at the gage is used for high flow measurements. No equipment changes were made this water year.
Hydrographic Conditions.--	The Bear Creek drainage is a mix of mountains and urban landscape. It extends from the mountains near Mt. Evans down to the City of Sheridan before entering the S. Platte River. Runoff was light this year due to above average snow pack in the upper and lower basins. Rainfall was also less than average throughout the summer. In the summer of 2005, the Town of Morrison constructed a new bike path along the creek and past the gage. It does not seem to be affecting the gage or nearby creek banks in a negative manner.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record as back up. Record is complete and reliable except for the following periods : December 5, 15-23 2008; January 4-6, 26, 27, 2009, when the stage discharge relationship was affected by ice; December 5, 2008 to March 6, 2009 when ice was observed in channel resulting in possible ice affect; May 14-28, when the well inlet was partially closed or plugged and there was some GH movement but does not show variation expected; July 22-27, when the inlet valves were left closed and there was no GH record. Missing data values were filled in using the chart on 10/9, 17, 20, 22-24, 11/23, 11/28-30, 12/1, 4, and 3/8/2009 when the DCP was missing transmissions with no loss of accuracy. On April 29, 2009 a log was noted on the weir plate but was not removed. On May 7, 2009 at 16:35 the log was removed and a -0.02 ft gage height correction was noted in the 15-minute transmitted data. This correction was run from April 29 – May 7 as a -0.02 ft debris (Datum) correction. Since the timing on when this log actually was caught was assumed sometime between April 17 (before runoff) and April 29 (runoff), the correction was prorated from April 17 to April 29. The mean gage height for Measurement 979 (4/29) was adjusted -0.02 ft due to a log on the control.
Datum Corrections.--	Levels were run this year. No corrections were necessary or made .
Rating.--	The control is a compound weir consisting of a broad crested concrete wall with a six-foot sharp-crested Cipolletti notch (one-foot deep) for low flows. Rating No. 23 was developed from the standard Cipolletti for the first foot and from measurements made in 2003 above the first foot. The rating shows a break in slope around GH = 6.0 as flow goes above the notch and out over the much wider section of broad crested weir. Rating 23 is defined by measurements to 346 cfs, but it is not well defined around GH = 6.0 ft where the flow transitions out of the Cipolletti. Nineteen measurements (Nos. 970-988), ranging in discharge from 7.12 to 89.7 cfs were made this year. The peak flow of 159 cfs occurred at 1315 June 2, 2009 at a gage height of 6.91 feet (GH correction of -0.01 ft applied) with a shift of -0.01 ft. It exceeded measurement No. 979, made April 29, 2009 by 0.26 ft.
Discharge.--	Shifting control method was used this year. Shifts are caused by scour and fill in weir pool, uneven flow when the stage tops the notch and flows over the wall, and by ice-affect in the winter. Shifts generally have been negative at high and low stages and zero in the middle. Measurements show unadjusted shifts varying from -0.07 to +0.01 ft. Shifts were distributed by time from October 1 to April 29. The ice period December 15-23 was considered to be the point of change for shifts during December. All measurements were given full weight. Shifts were distributed using a stage-shift table from April 29 to September 30. Measurements 979, 982, 986 and 987 were adjusted from -1% to +4% to fit the table. High flow measurements 931 and 935 from 2007 were included in the table to cover the range in stage experienced.
Special Computations.--	Determination of ice affect involves some judgment, since the flow does fluctuate and peaks and bumps in the graphic record do not always mean ice. Also, flows in the winter are often less than 25 cfs, and as such are contained 100% within the Cipolletti notch. When flow is completely through the notch, measurement shifts often show little ice affect even if there is heavy ice in the gage pool behind the weir. The general approach is to examine the graphic record and temperatures to identify periods of likely ice-affect. When the primary GH graph rises at night when the temperature is well below freezing, ice is usually indicated. (The primary GH graph is most reliable here, since the encoder is on an oil cylinder and the chart record is not. Sometimes ice in the well causes the chart and encoder to differ.) Record can sometimes be estimated by chopping off ice peaks and correcting the GH. After editing any suspect GH's, we examine the computed discharges with temperature trends, and with figures from nearby USGS gages. If discharges rise when temperatures fall or if computed record is out of line with other gages, then some ice-affect is presumed. Estimates are made which are consistent with other gages, temperatures, and climate data. Discharge for December 5, 15-23 and January 4-6, 26, 27 was estimated from adjacent record and temperature trends. July 22-27 was estimated using the upstream USGS gage at Evergreen.
Remarks.--	The record is good, except for periods of ice effect which are estimated and poor, periods of potential ice effect which are considered fair, period of partially plugged intakes which considered fair to poor, and the period of closed intakes which is estimated and poor. Station maintained and record developed by Jana Ash.

Recommendations.--

A new rating table may be necessary for higher flows (i.e. flows above 200 cfs). A series of measurements should be focused around gage heights where flows transition out of the weir notch in order to better define the rating. An outside gage should be installed. Also, it would be a good idea to check the highway bridge for a MSL benchmark and tie our new control BM back to sea level. Weekly measurements and ice observations with photos would help in evaluating how the ice affects the weir.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06710500 BEAR CREEK AT MORRISON

RATING TABLE--

BCRMORCO23 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

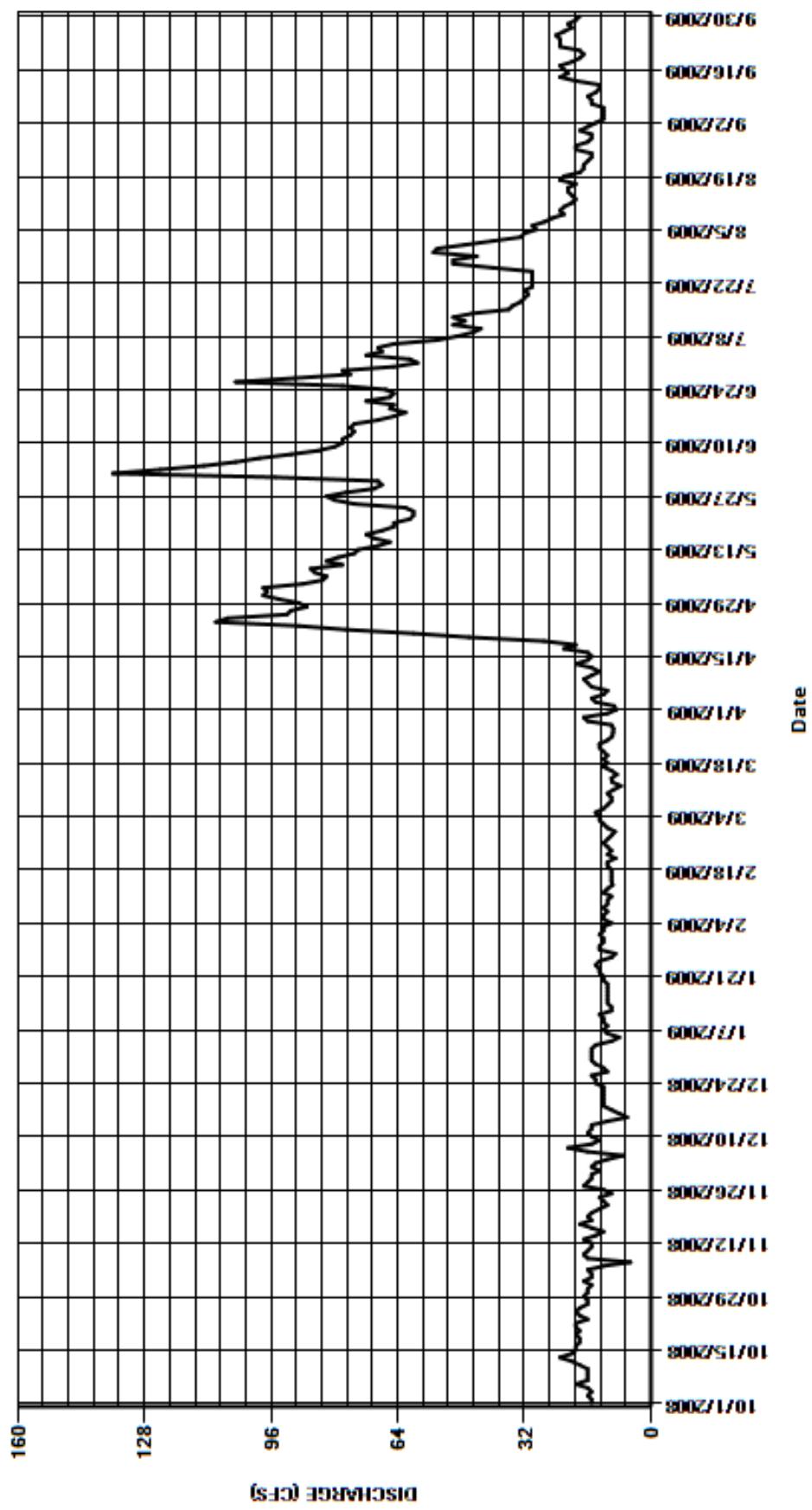
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	15	13	15	13	11	8.8	98	95	59	47	16
2	15	17	15	15	12	12	9.3	97	136	61	40	14
3	16	15	14	14	12	13	14	98	124	72	33	12
4	15	15	11	10	10	13	15	88	113	68	32	12
5	16	16	7	8	12	14	12	83	105	69	29	12
6	19	12	16	11	12	12	11	82	99	65	30	12
7	16	5.2	21	12	11	11	15	85	91	54	27	15
8	16	16	15	11	12	10	16	86	84	49	25	15
9	16	17	13	12	11	10	17	78	80	45	22	16
10	16	16	15	12	11	11	15	82	78	43	23	14
11	18	15	16	13	10	9.5	13	79	78	50	22	13
12	20	15	15	10	12	7.6	15	75	76	47	20	13
13	23	17	15	10	11	9.8	19	74	75	50	19	19
14	20	14	11	11	9.7	10	16	69	76	45	20	23
15	19	12	6	11	10	8.6	15	66	75	36	21	21
16	19	15	8	11	10	10	16	70	69	35	21	22
17	18	18	10	11	10	12	22	72	65	33	19	23
18	18	15	12	11	10	11	19	68	62	32	23	20
19	19	16	12	11	11	12	27	65	66	31	22	18
20	18	15	12	12	11	11	46	65	65	32	18	17
21	19	13	12	12	9	12	60	61	72	30	17	18
22	19	11	12	13	11	13	77	60	66	30	17	23
23	16	12	12	13	10	13	89	60	65	30	16	23
24	18	13	14	14	11	11	110	62	67	30	15	23
25	19	10	14	13	12	9.8	107	75	78	30	15	24
26	18	12	15	10	11	9.6	92	80	105	40	19	22
27	16	17	11	9	10	9.5	91	82	90	50	19	20
28	16	16	12	13	9.1	10	87	77	76	50	16	21
29	17	15	14	13	---	16	89	70	78	44	15	19
30	16	15	15	12	---	17	94	68	65	55	15	18
31	16	---	15	12	---	11	---	69	---	54	18	---
TOTAL	542	430.2	403.0	365.0	303.8	350.4	1237.1	2344	2474	1419	695	538
MEAN	17.5	14.3	13	11.8	10.8	11.3	41.2	75.6	82.5	45.8	22.4	17.9
AC-FT	1080	853	799	724	603	695	2450	4650	4910	2810	1380	1070
MAX	23	18	21	15	13	17	110	98	136	72	47	24
MIN	15	5.2	6	8	9	7.6	8.8	60	62	30	15	12
CAL YR	2008	TOTAL	9578.1	MEAN	26.2	MAX	95	MIN	5.2	AC-FT	19000	
WTR YR	2009	TOTAL	11101.5	MEAN	30.4	MAX	136	MIN	5.2	AC-FT	22020	

MAX DISCH: 159 CFS AT 13:15 ON Jun. 02,2009 GH 6.91 FT. SHIFT -0.01 FT. (GH CORR. -0.01 FT APPLIED)

MAX GH: 6.91 FT. AT 13:15 ON Jun. 02,2009 (GH CORR. -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06710500 BEAR CREEK AT MORRISON
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06711500 BEAR CREEK AT SHERIDAN
Water Year 2009

Location.--	Lat. 39°39'08", Long. 105°01'57", in NW 1/4 NW 1/4 sec. 5, T, 5 S., R. 68 W., Arapahoe County, Hydrologic Unit 10190002 on left bank just downstream from bridge on South Lowell Blvd., at Highway Department maintenance building at northwest city limits of Sheridan, 1.3 mi upstream from mouth, and 2.1 mi west of city hall in Englewood.
Drainage and Period of Record.--	260 mi ² . April to Nov. 1914, March 1927 to current year. Monthly data only prior to Oct. 1933.
Equipment.--	Stevens A-35 graphic stage recorder was removed this year, and Sutron 8210 DCP with digital shaft encoder and phone (speech card) modem in a 42 inch corrugated metal shelter and well with supplemental outside wire weight gage remains. The wire weight gage was damaged by vandalism and has not been repaired. No outside readings were made during the 2009 water year. The DCP can be accessed by phone. Currently, no backup to the shaft encoder is present.
Hydrographic Conditions.--	Flows are controlled by releases from Bear Creek Lake, approximately 6 miles upstream. The land between the gage and the lake is urban, and sharp peaks are observed as a result of storm runoff. The gage is directly affected by local precipitation since there is a large storm culvert just upstream which drains a large shopping center. The peak flow usually occurs as a sharp, short-duration storm event.
Gage-Height Record.--	The primary record is hourly averaged 15-minute data from satellite with partial year chart back-up. The record is complete and reliable for the entire year, except for a few hours each day on Nov. 23, 2008 and May 14, 2009, and from May 14-Sept. 30, 2009 one 15 min value at 18:00 was missing on each day. The Nov. data was taken from the chart, and all other data was estimated. Possible ice effect was seen on November 26 and December 15. Ice affect was seen on December 21-22, 2008. Corrections were made after clearing debris from the control (which results in a drop in gage height). Corrections in gage height as a result of debris on the control were applied as follows: Oct 2, 2008: -0.03 ft, applied to 0000 Oct. 1 to 1500 October 2. November 13, 2008: -0.03 ft, manually applied back to a high water event on October 5, 2100 that most likely deposited the debris. April 24, 2009, -0.07 ft, applied back to a high water event on April 18 that most likely deposited the debris. The inlets were flushed almost every visit in an attempt to keep the inlets clean and eliminate any flush corrections. Two such flush corrections were necessary and applied: June 17, +0.04 ft applied back a couple of hours to a low point in the hydrograph where the pipe most likely plugged up, and June 29, +0.03 ft applied back one hour to a low point on the hydrograph, where the pipe most likely plugged up.
Datum Corrections.--	Levels were last run on July 26, 2006. No correction were necessary.
Rating.--	The control for all stages is a rock and concrete dam approximately ten feet below the gage with about 5 ft. of drop behind it. Downstream conditions have never been observed to cause backwater at the gage. The dam has an uneven surface, with rebar sticking out in spots. Debris tends to accumulate at low flows, particularly in the fall when leaves are dropping. Rating No. 32 was developed for the 1998 water year, and continued in use for the present year. It is defined by measurements to 661 cfs.. In past years the gage has experienced short peaks well above the rating, so the rating has been extrapolated to 3000 cfs. However, any flows above 1000 cfs need to be considered estimates. Nineteen measurements (Nos. 953 - 971) were made this year ranging in discharge from 6.16 to 147 cfs. They cover the range in discharge experienced except for days with lower mean daily flows on Nov 11, Dec 6, and Apr 15; and higher mean daily flows on April 25-29, May 1-3, and 25-27, June 2-6, and 26, 2009. The peak flow of 795 cfs occurred at 2145 on Jul 25, 2009 at a gage-height of 4.96 feet with a shift of 0.00 feet. It peak exceeded measurement No. 962 (made on April 29, 2009), by 1.65 ft. in stage.
Discharge.--	Shifting control method was used for the record year. Shifts were caused by scour and fill of the approach pool and material passing over the control. Shifts were distributed by time with consideration to stage for the entire water year. Measurements show shifts varying from -0.02 to + 0.01 ft. Shifts were distributed by time. All measurements were given full weight except for Nos. 957, 960, 963, 965, and 970 which were adjusted up to 4% to smooth distribution. Consideration to stage was given between No 961 (4/16) and No. 962 (4/29) by using the event peak on 4/18 as a distribution point. Consideration to stage was given between No 967 (7/22) and No. 968 (8/05) by using the yearly peak flow event on 7/25 as a distribution point. Flow conditions are relatively steady year-round and fluctuate little from rain events. The majority of flow represents a controlled release from Bear Creek Lake approximately 6 miles upstream. This steady flow allows for reasonable assumptions to be made during periods of estimated record.
Special Computations.--	Computed record was used for possible ice affect days of November 26 and December 15. December 21- 22 were estimated from temperatures and adjacent good record.
Remarks.--	The record is rated as good, except for periods of possible ice effect, which are fair and periods of ice effect, which are estimated and poor. Station maintained and record developed by Jana Ash.
Recommendations.--	Continue visits every two weeks to ensure the control stays clear of debris, especially after rain events. The wire weight gage needs to be replaced or a staff pounded into the streambed. If possible, extra visits should be made during extreme cold to break ice in the well. Light construction should be done to remove the catch points on the control to help with debris affecting gage height. The rating above 1000 cfs needs to be confirmed by slope-area or some other indirect method.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06711500 BEAR CREEK AT SHERIDAN

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

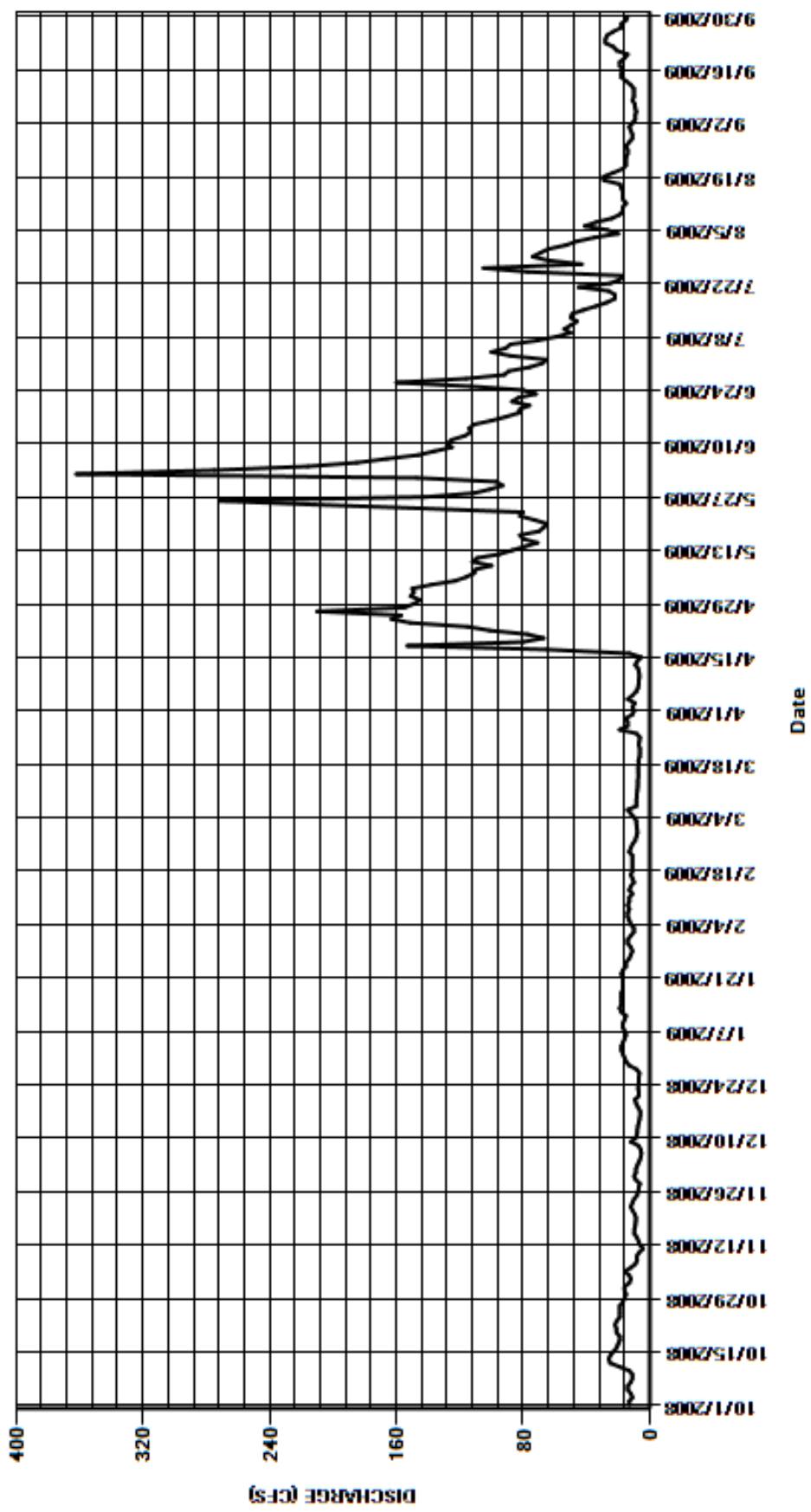
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	16	8.7	17	12	8.1	10	151	147	68	53	13
2	13	13	8.7	18	10	8.4	11	149	362	65	46	11
3	11	12	7.7	18	10	8.4	9.5	150	275	88	35	9.2
4	12	13	6.6	17	12	9.9	14	138	216	100	20	9.3
5	14	16	5.7	16	13	12	11	123	185	91	27	8.6
6	14	12	5.4	15	14	14	8.6	116	166	88	41	9.3
7	12	9.1	5.8	16	14	8.4	7.4	111	146	71	34	9.6
8	11	8	7.3	17	13	8.4	7.1	110	136	59	24	11
9	11	8.3	12	17	14	8.4	6.9	100	125	50	19	10
10	13	6.7	8.9	16	13	8.3	6.5	112	128	54	17	10
11	19	4.3	8.1	15	13	7.9	6.8	109	125	50	17	10
12	25	6.3	7.9	18	11	7.7	7.4	95	117	46	15	12
13	26	7.2	7.6	19	13	7.5	9.2	87	113	50	17	15
14	25	8.3	7	18	12	7.5	7.9	79	114	49	17	18
15	23	10	6.4	18	10	7.2	5.5	71	111	42	17	18
16	21	9.8	6.1	18	11	7.4	13	80	100	34	18	17
17	20	9.2	6.1	18	12	7.4	65	82	91	27	19	19
18	19	9	7.4	17	11	7.1	153	70	83	22	29	19
19	19	8.7	8.6	17	11	7.2	80	67	82	22	29	16
20	21	9.5	9.5	17	11	6.4	67	65	76	26	23	14
21	21	11	7	17	11	6.2	77	73	87	45	17	21
22	22	12	7	18	11	6.2	101	82	83	25	15	23
23	21	11	7.4	17	13	7	115	80	72	19	15	28
24	19	10	7.2	15	12	6.6	151	144	80	17	15	28
25	19	8	7	15	11	6.3	163	212	113	77	14	27
26	19	7.2	6.9	13	9.2	8.4	157	272	160	105	14	23
27	19	7.1	6.5	12	8.5	19	210	142	116	43	15	18
28	17	6.2	8.4	11	7.9	14	155	111	92	64	13	18
29	16	8.8	13	12	---	14	149	101	89	74	11	15
30	15	10	15	14	---	15	145	93	76	69	11	14
31	16	---	16	14	---	11	---	97	---	64	12	---
TOTAL	546	287.7	252.9	500	323.6	281.3	1929.8	3472	3866	1704	669	474.0
MEAN	17.6	9.59	8.16	16.1	11.6	9.07	64.3	112	129	55	21.6	15.8
AC-FT	1080	571	502	992	642	558	3830	6890	7670	3380	1330	940
MAX	26	16	16	19	14	19	210	272	362	105	53	28
MIN	11	4.3	5.4	11	7.9	6.2	5.5	65	72	17	11	8.6
CAL YR	2008	TOTAL	8982.2	MEAN	24.5	MAX	116	MIN	4.3	AC-FT	17820	
WTR YR	2009	TOTAL	14306.3	MEAN	39.2	MAX	362	MIN	4.3	AC-FT	28380	

MAX DISCH: 795 CFS AT 21:45 ON Jul. 25,2009 GH 4.96 FT. SHIFT 0 FT.

MAX GH: 4.96 FT. AT 21:45 ON Jul. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**06711500 BEAR CREEK AT SHERIDAN
WY2009 HYDROGRAPH**



PLATTE RIVER BASIN
06714000 SOUTH PLATTE RIVER AT DENVER
Water Year 2009

Location.-- Lat. 39°45'35", Long. 105°00'10", in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, T.3 S., R.68 W., Denver County, Hydrologic Unit 10190003, on right bank 90 ft upstream from Nineteenth Street Bridge in Denver and 0.4 mi downstream from Cherry Creek.

Drainage and Period of Record.-- 3,861 mi². May 1889 to Oct. 1890 sporadic record. July 1895 to current year continuous. Monthly data only for some periods.

Equipment.-- The shelter is 72 inch by 72 inch precast concrete structure with a 48 inch corrugated steel well. The station uses an electric drop tape, Sutron 8210 satellite telemetry with a phone modem interface (not currently used), a continuous chart recorder and a supplemental outside wire weight. A city water line is plumbed to the gage for flushing the inlets. USACE is a cooperator on the gage, and UDFCD has Alert instrumentation installed. Additionally, the UDFCD contracts with the USGS to operate a water quality sampler there.

Hydrographic Conditions.--

Gage-Height Record.-- The primary record is hourly averages of fifteen minute data taken from satellite monitoring with chart backup. Daily maximum and minimum stages for the satellite record checked to within +/- 0.02 ft with the chart. Missing satellite data on November 23, 2008, March 8, and June 26, 2009 were filled in with chart data with no loss of accuracy. The record is complete and reliable.

Datum Corrections.-- Levels were run on September 24, 2009, but were inconclusive due to conflicting readings from R.M. #1 and R.M. #2. No correction was made at that time, and levels will be run again in the spring. Reference Marks #7 and #8 were also added to increase accuracy as RM# 2 has possibly moved.

Rating.-- The control is a rock gabion dam approximately 50 feet below the gage. Rating No. 34 was developed this year and was begun in use on October 1, 2008. It is defined by measurements from 39.4 to 5340 cfs. Rating No. 34 was extended to 12,600 cfs using a peak flow on July 25, 1998 that was indirectly calculated using records from downstream gages. Seventeen measurements (Nos. 968-984) ranging in discharge from 93.3 to 1370 cfs were made this year. These cover the range in stage experienced, except the higher daily flows of April 18; April 27; May 24-26; June 2-14; and July 4, 2009. The peak flow of 5260 cfs occurred at 0030 on May 26, 2009 at a gage height of 8.13 ft with shift of 0.00 ft. It exceeded measurement no. 977, made on June 12 by 3.01 ft. Peak flow at this gage usually defies measurement — often occurring as a sharp, transitory rise at night.

Discharge.-- Shifting control method was used all year. The channel has a sand bottom and is continually scouring and filling as flow passes through the gabion control. The control slows and deepens the flow. Sustained periods of high flow at this gage will cause positive shifts, indicating scour. Measurements show unadjusted shifts varying between -0.01 to +0.04 feet. All measurements were given full weight, except No. 974 which was adjusted -3% to smooth shift distribution, and No. 977 which was adjusted +1% to zero to the new rating. Shifts were prorated by time with consideration given to stage for the entire period of record. Each storm event was analyzed to verify that the peak flow had a shift that was consistent with any possible stage distribution.

Special Computations.-- The "spill", as added to some of the measurements in the past, is the regulating discharge from the Farmers and Gardeners Ditch. The spill is just upstream and across the channel from the gage. The ditch and associated Parshall flume are covered and buried, so the spill emerges from a culvert. Normally there is no place below the spill where a good measurement can be made, so upstream measurements are made with this "Spill" added to the total. There wasn't any spill during measurements this year. It is impossible to actually measure the spill since it shoots out from under a gate down and sluices down to the river. Velocities are supercritical and the flow has air in it. Often 10 cfs is estimated, based on a ditch rider statement that the headgate will take a maximum of 35 cfs from the river and the ditch is decreed at 24 cfs. At low flow, this estimate can have a significant effect on measurement accuracy. Extreme low flow measurements have been made downstream of the Farmers and Gardeners Ditch spill and just upstream of the control pool. Normally this section is too deep to wade.

Remarks.-- The record is considered good. Station maintained and record developed by Jana Ash.

Recommendations.-- Run levels in the spring of 2010 and summarize past observations in a levels summary spreadsheet.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06714000 SOUTH PLATTE RIVER AT DENVER

RATING TABLE--

PLADENCO34 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	124	125	143	95	116	123	149	457	1320	835	445	175
2	121	120	138	96	112	127	191	671	2740	870	414	150
3	121	107	138	96	108	120	150	690	1750	1390	493	134
4	127	117	140	97	103	116	226	675	2510	1490	374	140
5	186	134	146	98	102	106	181	714	2660	1170	353	131
6	284	118	135	103	103	103	182	538	2430	1190	532	136
7	147	111	125	105	108	97	163	466	2280	1200	383	137
8	131	110	133	115	110	97	159	402	1890	889	211	141
9	124	109	189	112	115	98	146	431	1600	787	241	157
10	127	109	157	176	114	101	132	669	1470	896	201	135
11	153	104	136	208	136	117	130	550	1430	589	214	132
12	264	103	129	225	115	121	140	515	1410	351	169	150
13	189	107	122	243	113	119	142	388	1450	376	178	238
14	156	122	123	234	114	116	128	413	1390	463	194	166
15	164	118	111	225	109	112	119	400	1250	436	202	177
16	175	111	115	223	111	113	184	473	1040	345	219	177
17	162	108	120	229	111	110	905	430	1050	252	249	183
18	148	103	117	228	108	110	1740	428	987	230	399	202
19	142	100	126	226	111	110	1080	492	786	256	287	200
20	150	99	108	228	117	110	671	500	606	247	237	205
21	190	102	98	143	123	112	654	547	528	864	227	283
22	194	105	99	121	123	111	757	736	551	476	220	209
23	169	104	99	118	116	131	745	865	727	681	199	263
24	164	105	97	117	121	111	692	1630	759	453	195	222
25	156	105	96	120	122	108	616	1420	1200	451	173	298
26	156	103	98	118	122	152	671	2140	1270	1120	200	194
27	155	105	96	118	122	335	1580	524	1110	789	165	177
28	147	104	95	119	122	278	810	474	1060	484	192	177
29	145	147	99	118	---	256	730	1140	1040	484	198	173
30	134	148	103	116	---	290	508	1320	986	617	198	170
31	130	---	96	116	---	167	---	990	---	449	200	---
TOTAL	4935	3363	3727	4686	3207	4277	14681	22088	41280	21130	8162	5432
MEAN	159	112	120	151	115	138	489	713	1376	682	263	181
AC-FT	9790	6670	7390	9290	6360	8480	29120	43810	81880	41910	16190	10770
MAX	284	148	189	243	136	335	1740	2140	2740	1490	532	298
MIN	121	99	95	95	102	97	119	388	528	230	165	131

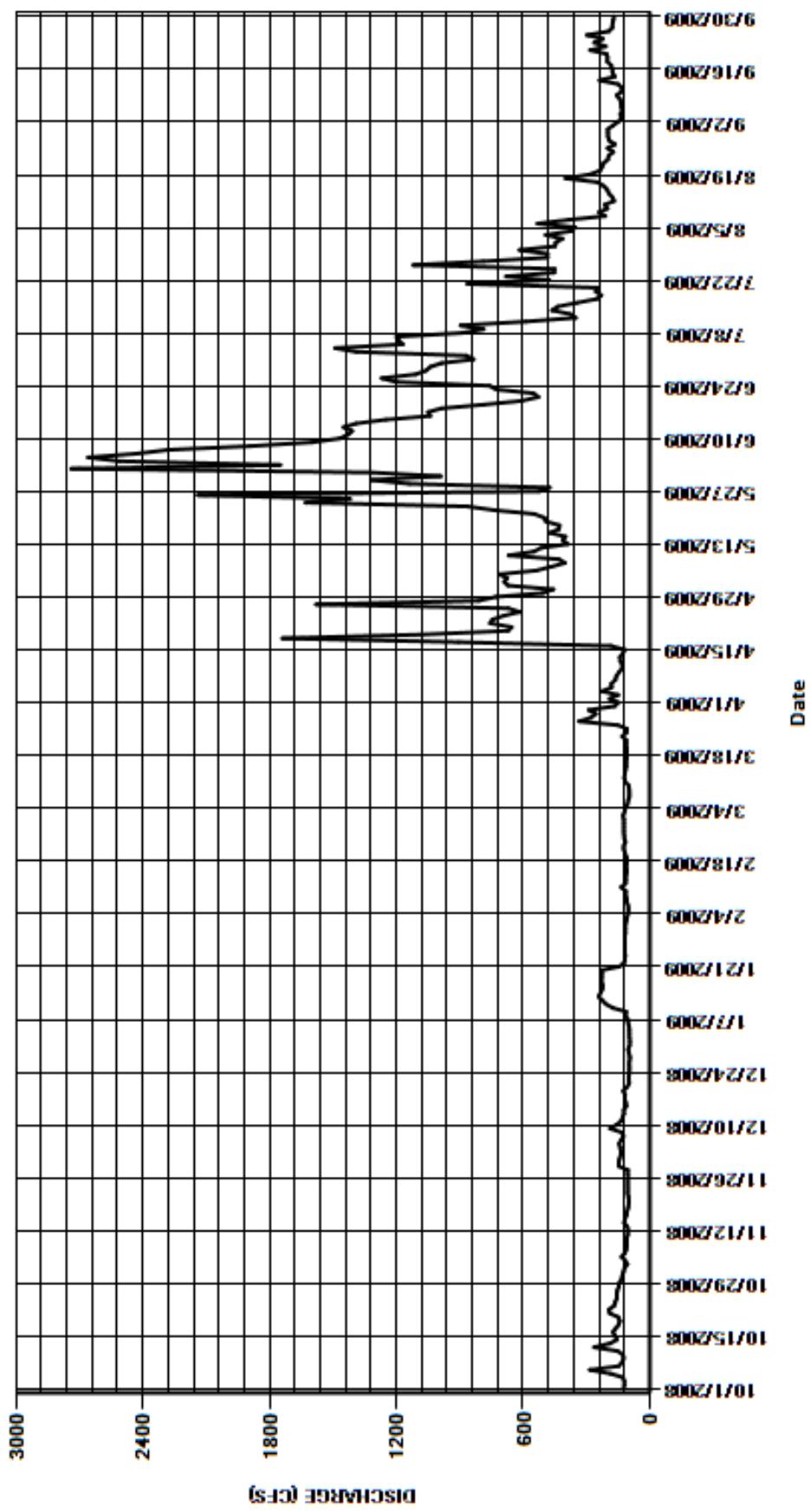
CAL YR	2008	TOTAL	101739	MEAN	278	MAX	1870	MIN	95	AC-FT	201800
WTR YR	2009	TOTAL	136968	MEAN	375	MAX	2740	MIN	95	AC-FT	271700

MAX DISCH: 5260 CFS AT 00:30 ON May. 26,2009 GH 8.13 FT. SHIFT 0 FT.

MAX GH: 8.13 FT. AT 00:30 ON May. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06714000 SOUTH PLATTE RIVER AT DENVER
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.
Water Year 2009

Location.-- Lat 39°45'20", long 105°33'24", in SE1/4, Sec. 28, T.3 S., R.73W., Clear Creek County. Gage is located on right upstream bank of the I-70 box culvert, near the Fall River Road Exit (238) approximately 20 ft. past Fall River Road.

Drainage and Period of Record.-- Not determined. Gage established July 2007 at present site and datum to monitor minimum stream flow reach and aid in the administration of water rights.

Equipment.-- Sutron Satlink 2 Data Collection Platform (DCP) and Sutron AccuBubble unit in a 12-inch by 30-inch by 36-inch NEMA4 enclosure at a concrete box culvert with a steel sill plate. A staff gage located on the right edge of water is the primary reference with an additional staff gage located on the left edge of water wing wall of the culvert as backup (datum offset is applicable). A single orifice line in 2-inch ridge conduit extends from the NEMA4 enclosure and terminates in a gravel packed muffler buried in the stream bed approximately 5-feet upstream from the steel sill plate.

Hydrographic Conditions.-- Varying topography mainly consisting of highly vegetated mountainous areas. Flow is partly regulated by several reservoirs located upstream of the gage near St. Mary's Glacier.

Gage-Height Record.-- The primary record is hourly averages of 15-minute telemetered bubbler data with DCP logged data as backup. Instrument calibration was supported by 18 visits to the gage. The record is complete and reliable, except for: November 23, 2008; October 10, 2008 and May 18, 2009; when 1-2 hours of transmitted data were either missed or never received. Hourly values were interpolated from adjacent periods of good record without loss of accuracy. December 5, 2008 to April 6, 2009 the gage was disabled for winter and no gage-height record is available. The instrument was set once in the fall and once in the spring. Gage height corrections of up to 0.05 ft were applied based on staff readings. The instrument was hard to set due to unsteady flow conditions. These conditions worsened after runoff when cobble had filled in the stilling basin behind the control. Unstable GH's affected gage calibration, data bounce, and accuracy of measurement gage heights.

Datum Corrections.-- No levels were run this year.

Rating.-- Shifts result from material moving into the stilling basin, debris accumulation in the channel and from an incomplete definition of the rating. With additional discharge measurements subsequent ratings should better define the channel. The channel is composed primarily of gravel and embedded small boulders. The control at all stages is a metal sill mounted in front of the box culvert running under I-70 approximately 5-feet below the gage. The channel is straight above and below the gage. Rating No. 2 developed on June 28, 2008 was used all year and is defined by measurements from 3.66 cubic feet per second (cfs) to 64.9 cfs. Thirteen (Nos. 31-43) measurements were made this year, ranging from 3.83 cfs to 61.0 cfs. The peak discharge of 137 cfs occurred at 2230 on May 31, 2009 at a gage height of 2.10 feet with a shift of -0.05 feet. The peak exceeded measurement No. 36 made on June 3, 2009 by 0.46 feet of stage and 76.0 cfs respectively.

Discharge.-- Shifting control method was used all year. Shifts were distributed by time and all measurements were given full weight. Measurements showed unadjusted shifts ranging from -0.06 feet to +0.06 feet.

Special Computations.-- The peak exceeded 150% (97 cfs) of the highest rating measurement. Rating 2 was extrapolated to 127 cfs (gage height of 2.0 ft) in development. Discharge for the peak equivalent gage height of 2.05 ft was extrapolated linearly.

Remarks.-- The record is fair, except for periods when flows exceeded 150% of the highest measurement (June 1, 26-27), and the instantaneous peak of May 31, 2009, which are poor due to lack of rating definition. Station maintained and record developed by Jana Ash.

Recommendations.-- Levels need to be run. Additional reference marks and the PZF need to be established. Rating measurements are needed with good stilling conditions. The width of the sill should be recorded and a new rating computed with comparison to the corresponding sharp crested contracted weir. Photo of new control is needed for the station description. Cleanout of cobble filling in front of the control should be done when the gage is opened. Consideration should be given to placing a structure upstream for energy dissipation and interception of moving material. Also, widening and deepening the upstream channel can be done to increase stilling.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.

RATING TABLE--

FALIDACO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	7.2	3.8	---	---	---	---	---	95	52	30	17
2	16	7.2	3.8	---	---	---	---	---	80	53	22	21
3	17	7	3.3	---	---	---	---	---	59	54	21	25
4	20	4.4	2.4	---	---	---	---	---	60	50	21	25
5	22	3.4	---	---	---	---	---	---	63	43	20	23
6	22	2.2	---	---	---	---	---	---	63	37	19	20
7	20	3.6	---	---	---	---	---	16	65	36	19	18
8	12	4.8	---	---	---	---	---	16	57	33	19	17
9	15	4.2	---	---	---	---	---	17	53	33	22	16
10	22	4.2	---	---	---	---	---	17	52	33	28	15
11	23	4.3	---	---	---	---	---	17	49	35	31	15
12	23	4	---	---	---	---	---	21	45	35	34	21
13	21	4.1	---	---	---	---	---	24	45	36	33	20
14	19	3.9	---	---	---	---	---	25	48	34	33	18
15	18	4.4	---	---	---	---	---	29	53	32	32	21
16	15	4.4	---	---	---	---	---	31	51	29	31	22
17	15	4.2	---	---	---	---	---	37	55	27	31	21
18	14	3.9	---	---	---	---	---	50	62	26	33	19
19	14	4	---	---	---	---	---	54	67	26	33	18
20	14	3.7	---	---	---	---	---	61	72	26	32	18
21	14	3.8	---	---	---	---	---	61	71	25	31	17
22	14	3.6	---	---	---	---	---	54	74	25	29	8.7
23	13	3.5	---	---	---	---	---	50	74	24	27	11
24	11	3.3	---	---	---	---	---	55	75	24	28	18
25	10	4.1	---	---	---	---	---	53	83	24	27	18
26	10	3.6	---	---	---	---	---	50	89	25	26	17
27	9.7	3.5	---	---	---	---	---	39	89	23	24	17
28	9.8	3.5	---	---	---	---	---	44	73	22	19	16
29	9.6	3.2	---	---	---	---	---	52	68	22	19	15
30	9	3.5	---	---	---	---	---	55	59	25	19	16
31	8.5	---	---	---	---	---	---	67	---	25	18	---
TOTAL	476.6	124.7	13.3	---	---	---	---	995	1949	994	811	543.7
MEAN	15.4	4.16	3.32	---	---	---	---	39.8	65	32.1	26.2	18.1
AC-FT	945	247	26	---	---	---	---	1970	3870	1970	1610	1080
MAX	23	7.2	3.8	---	---	---	---	67	95	54	34	25
MIN	8.5	2.2	2.4	---	---	---	---	16	45	22	18	8.7

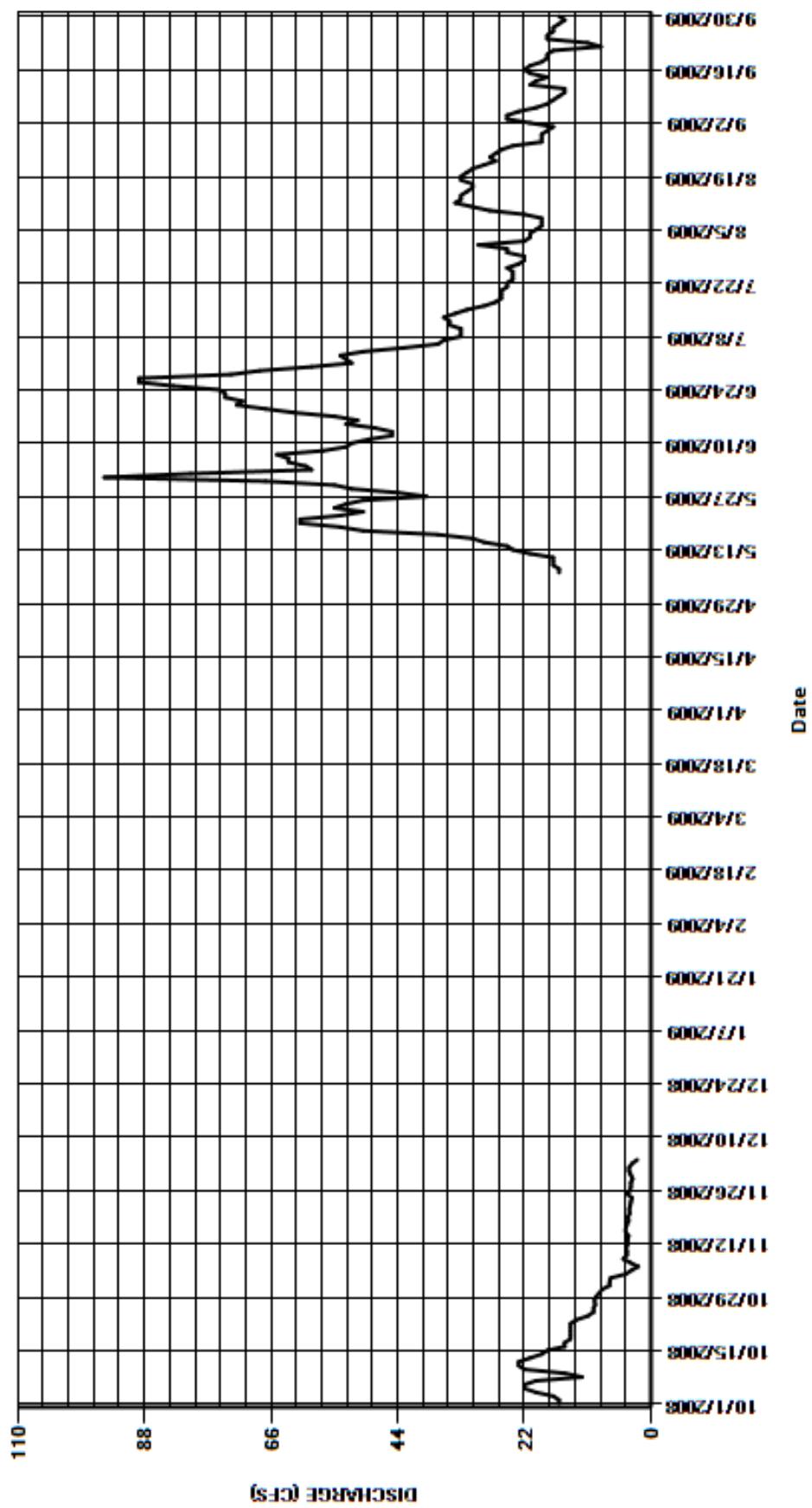
CAL YR	2008	TOTAL	5804.0	MEAN	23.7	MAX	82	MIN	2.2	AC-FT	11510	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	5907.3	MEAN	27.9	MAX	95	MIN	2.2	AC-FT	11720	(PARTIAL YEAR RECORD)

MAX DISCH: 137 CFS AT 22:30 ON May. 31,2009 GH 2.1 FT. SHIFT -0.05 FT.

MAX GH: 2.1 FT. AT 22:30 ON May. 31,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06720000 CLEAR CREEK AT DERBY
Water Year 2009

Location.-- Lat 39°49'42", long 104°57'30", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, T.2 S., R.68 W., Adams County, Hydrologic Unit 10190004, on right bank 875 ft downstream from York Street bridge, 0.5 mi upstream from mouth, and 2.5 mi west of Derby.

Drainage and Period of Record.-- 575 mi 2 . April-Nov. 1914, 1927 to present.

Equipment.-- Graphic stage recorder and Sutron Satlink 2 DCP with digital shaft encoder in a 60 inch corrugated metal shelter and well. Primary reference is by electric drop tape. There is no outside reference. A tipping bucket rain gage is installed.

Hydrographic Conditions.-- Water is collected from the Clear Creek Drainage areas upstream and deposited ½ mile downstream into the South Platte River. Summer flows are affected by municipal and agricultural diversions upstream. In years of high snowpack, the runoff will exceed demand and much of the runoff will leave the basin past this gage. Gage also collects urban storm runoff and will see sharp peaks after rainstorms.

Gage-Height Record.-- The primary record is hourly averages of 15-minute data taken from the DCP with chart back-up. The record is complete and reliable, except for the following periods: December 15-18, 27, 2008; January 24-29, 2009, when the stage discharge relationship was possibly affected by ice. The periods had sustained below freezing temperatures. Two corrections were run for a few days each: a -0.01 ft encoder calibration was pro-rated from 11/13/08 back to the last calibration visit. A -0.02 ft control cleaning on 2/24/2009 was run back about a week to a high wind period when weeds were presumed to have blown on to the control.

Datum Corrections.-- Levels were run on September 24, 2009. The RP was found to be 0.02 ft. low. It was not corrected.

Rating.-- The control is a rock dam formed by a pipeline crossing approximately 25 feet below the gage. Shifts are caused by changes in the channel geometry, accumulation of material on the control and possible ice effect. Rating No. 34 put in use on October 1, 1998 was used again this year. It is well defined to 1500 cfs. Eighteen measurements (Nos. 943 - 960) were made this year ranging from 5.12 to 1810 cfs. They cover the range in discharge experienced except for lower daily flows experienced March 17-18, 20, April 11-15, and Sept. 15 and 29, 2009. The peak flow of 2640 cfs occurred at 1730 on June 14, 2009 at gage height of 4.25 ft. with a shift of -0.16 ft. It exceeded measurement No. 953 made June 2, 2009 by 0.53 feet in stage.

Discharge.-- Shifting control method was used for the record year. Shifts were applied as defined by measurements. This year's measurements show unadjusted shifts varying between -0.16 and 0.07 feet. There is an obvious stage/discharge relationship at this station; therefore stage shifting was used for the entire water year 2009, with exception of October 1, 2008-November 13, 2008, when shifts were distributed by time proration. During this time period, the flow was relatively flat. Two variable stage shift curves were developed and differ only in the lower end flows before and after the high water. Shifts were distributed by stage using CLEDERCOSC1 for the period: Nov 13, 2008 to July 28, and, using CLEDERCOSC2 for the period July 28 to the end of the water year. Each variable shift table incorporated all measurements made during the period of application. Measurement Nos. 946 (5%), 952 (-5%), and 957 (3%) were adjusted for smoothing purposes.

Special Computations.-- December 15-18, 27 were estimated from adjacent good record. January 24-29 were estimated from temperature trends and adjacent good record (including a measurement on January 30).

Remarks.-- The record is good, except for periods of ice effect, which are estimated and poor. Station maintained and record developed by Jana Ash.

Recommendations.-- A new rating is needed. The control is stable but needs regular cleaning to remove branches and debris. More measurements need to be made at higher flows, especially in late Spring/early summer when the peak normally occurs.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06720000 CLEAR CREEK AT DERBY

RATING TABLE--

CLEDERCO34 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

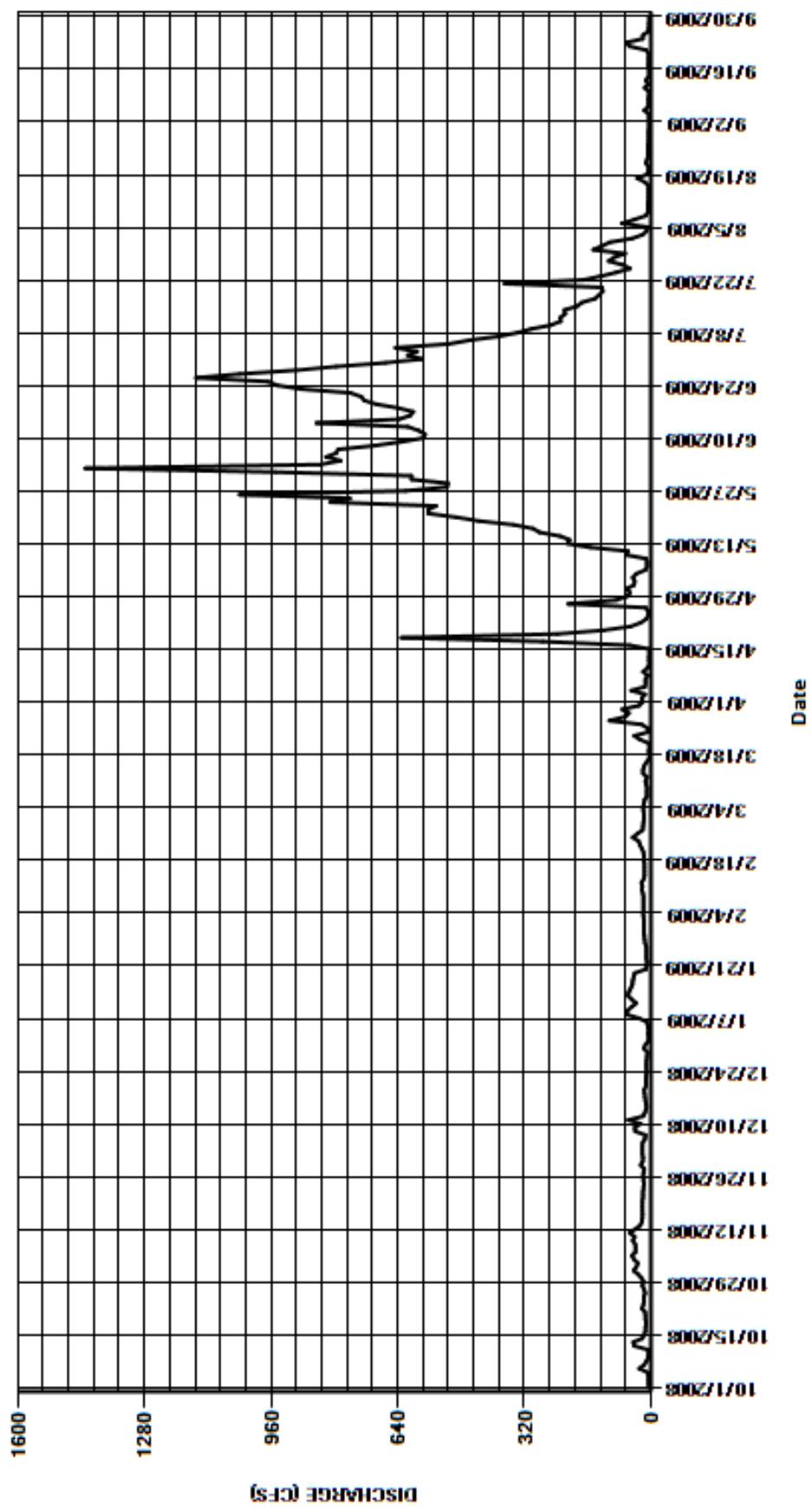
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.2	44	20	6.2	18	18	21	62	950	578	104	5.2
2	6	37	22	5.8	18	18	23	43	1430	615	48	5.3
3	6.3	33	22	7.6	19	19	15	41	835	591	21	5.7
4	6.2	43	22	6.1	20	20	50	46	784	646	11	5.3
5	8.5	48	21	8.3	19	18	15	37	821	511	7.6	17
6	30	39	15	10	19	16	14	14	796	458	74	6.8
7	17	39	14	30	19	10	14	9.8	791	385	42	6.4
8	11	40	40	62	19	11	8.5	10	699	337	14	6.4
9	6.8	46	41	60	20	10	20	12	633	302	7.4	5.6
10	6.2	41	26	49	23	12	8.8	63	576	253	8.3	5.7
11	7.4	54	57	37	22	14	4.3	58	571	228	7.7	16
12	42	40	20	49	24	10	5.1	154	587	229	6.8	7.3
13	45	27	15	58	18	20	5	211	615	217	6.7	13
14	22	23	12	56	16	20	4.2	206	846	219	6.6	5.4
15	17	22	12	51	16	17	4.3	230	637	187	6.7	4.9
16	14	21	14	47	16	11	53	282	609	175	6.1	5.6
17	14	22	15	46	16	4.3	274	298	601	142	16	7.1
18	12	22	16	44	19	4	631	347	639	131	35	5.9
19	14	22	17	41	18	6.1	237	435	694	122	9.8	6.1
20	14	21	13	13	19	3.9	119	492	725	124	6.1	5.7
21	15	20	13	11	23	5.4	52	563	732	370	6	12
22	23	20	13	10	28	28	26	563	760	171	13	54
23	19	19	12	12	31	42	12	543	882	127	9.7	62
24	18	18	11	12	46	5.6	6.6	811	945	88	7.1	21
25	18	19	12	12	34	8.7	7.1	761	968	53	7.6	20
26	15	20	12	12	21	24	13	1040	1150	72	7.2	6.2
27	17	19	11	15	20	105	209	620	1040	107	7.7	5.9
28	22	17	10	16	19	66	88	516	898	93	6.1	5.5
29	18	26	9.2	17	---	56	60	513	796	65	6	4.5
30	24	21	18	18	---	73	53	605	671	146	6.3	5.6
31	32	---	14	18	---	30	---	606	---	124	5.8	---
TOTAL	527.6	883	569.2	840.0	600	706.0	2052.9	10191.8	23681	7866	527.3	343.1
MEAN	17	29.4	18.4	27.1	21.4	22.8	68.4	329	789	254	17	11.4
AC-FT	1050	1750	1130	1670	1190	1400	4070	20220	46970	15600	1050	681
MAX	45	54	57	62	46	105	631	1040	1430	646	104	62
MIN	6	17	9.2	5.8	16	3.9	4.2	9.8	571	53	5.8	4.5
CAL YR	2008	TOTAL	28021.4	MEAN	76.6	MAX	741	MIN	3.1	AC-FT	55580	
WTR YR	2009	TOTAL	48787.9	MEAN	134	MAX	1430	MIN	3.9	AC-FT	96770	

MAX DISCH: 2640 CFS AT 17:30 ON Jun. 14,2009 GH 4.25 FT. SHIFT -0.16 FT.
MAX GH: 4.25 FT. AT 17:30 ON Jun. 14,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06720000 CLEAR CREEK AT DERBY
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06720500 SOUTH PLATTE RIVER AT HENDERSON
Water Year 2009

- Location.-- Lat. 39°55'19", Long. 104°52'00", in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, T.I S., R,67 W., Adams County, Hydrologic Unit 10190003, on right bank 500 ft upstream from bridge on State Highway 22 and 0.2 mi northwest of Henderson.
- Drainage and Period of Record.-- 4,768 mi 2 . May 1926 to current year. Monthly data only prior to 1933. Periodic water quality data available starting in 1955.
- Equipment.-- Graphic stage recorder and digital shaft encoder in 42-inch corrugated metal pipe shelter and well. A 10 ft x 20 ft building located 10 ft upstream from the well shelter houses a Sutron 8210. The shaft encoder connects to the DCP through conduit running between shelters. The primary reference is an electric tape gage in the shelter and well. A cantilevered wire weight gage just downstream of well is used as a supplemental reference. The stilling well is connected to stream by three 2-inch intakes, each equipped with flushing provisions. One moveable flushing funnel serves one of the intakes. The other two intakes are flushed using an electric pump in the gage with a reservoir tank attached to the intakes.
- Hydrographic Conditions.-- Reservoirs and diversions above 64th Avenue (and Metro Wastewater) often totally control the flow to that point, leaving the Henderson gage to be strongly influenced by the Metro effluent and Clear Creek. Low flows exhibit a strong diurnal due to the Metro effluent. High snowpack in Clear Creek basin will usually signal snowmelt runoff periods at Henderson. Peak flows are usually seen from storm events. Rainstorm runoff from the metro area in the spring and summer will contribute sharp high peaks, often in the early morning hours. Under conditions of high basin-wide runoff, releases from Chatfield Reservoir upstream are regulated to keep the flow at or below 5,000 cfs at Henderson.
- Gage-Height Record.-- The primary record is hourly averages of fifteen minute data taken from satellite monitoring with chart backup. The record is complete and reliable. The shaft encoder remained in good calibration this year. Thirty-four visits were made to the gage this year ensuring instrument calibration. Only one calibration adjustment was required (August 13, 2009), which was caused by the beads becoming misaligned after maintenance work. Chart record was used during the period that the shaft encoder was out of calibration without loss of accuracy. The control has created a sand bar moving in the direction of the gage that caused the inlets to become buried. One inlet is currently free of sand with a working valve. Further maintenance is not being done as the gage is in the process of being moved to the other side of the river for water year 2010.
- Datum Corrections.-- Levels were run on September 24, 2009 using RM. No. 5 as base. A -0.05 foot correction was indicated but was not taken in lieu of further evaluation of the gage's stability as well as potential relocation of the gage.
- Rating.-- The control is a grouted rock dam, established in 2002 as a grade control structure by the Urban Drainage and Flood Control District. The rock dam has a low flow notch in the right of center portion of the control, and will effectively regulate flow at all stages. Prior to the dam construction, the control was a shifting sand and gravel channel, with high flows influenced by the bridge opening approximately 500 feet downstream. The channel had been scouring during the entire history of the gage. The old station has had numerous ratings and has had the stilling well re-installed at a lower datum twice in the last 20 years. The rock control raised the channel bed and PZF by 2 ft. Rating Number 33, developed in WY 2004, was used for the entire water year. It is fairly well defined over a range of 55 to 7500 cfs. Twenty measurements (Nos. 549-568) were made this year, ranging in discharge from 79.5 to 7090 cfs. They cover the range of stage experienced well. The peak flow of 7200 cfs occurred at 1430 on June 2, 2009 at a gage height of 8.94 ft with a shift of 0.21 ft. It exceeded the high measurement (No. 560) made concurrent to the peak event by 0.05 ft. in stage..
- Discharge.-- The channel has a sand bottom and is continually scouring and filling. Measurements show shifts varying between -0.08 and 0.21 feet. Time dependent as well as stage dependant shifting was used. Shifts were applied as follows: October 1, 2008 through April 10, 2009; time dependent shifting as defined by measurement Nos. 548 – 557, all of which were given full weight except for No. 549 which was adjusted -5% to better fit the shift distribution. April 10, 2009 through April 18, 2009: time dependant shifting with consideration given to stage. April 18, 2009 through June 2, 2009: stage dependant shifting using variable shift table PLAHENCOVST0901 comprised of measurement Nos. 558-560 and No. 526 made in the 2007 water year, all of which were given full weight. June 2, 2009 through July 2, 2009: stage dependant shifting using variable shift table PLAHENCOVST0902 comprised of measurement Nos. 560-562 and No. 526 made in the 2007 water year, all of which were given full weight. July 2, 2009 through September 30, 2009: time dependent shifting as defined by measurement Nos. 564-569, all of which were given full weight except for Nos. 563 and 568, which were adjusted 1% and 5% to smooth the shift distribution.
- Special Computations.-- Due to rapid stage changes, high flow measurement gage heights are usually computed as a weighted average of discharge. This is accomplished by inputting the Aquacalc section discharges and times into a spreadsheet containing gage height data and times. As discussed below, wading measurements made some distance downstream can also require time-delayed gage heights. The lag time is estimated from the distance divided by the measurement average velocity.
- Remarks.-- Record is rated as good. Many measurements were performed using half counts (20 second counts instead of the full 40 seconds). This method is employed to counteract the large and rapid changes in stage due to Denver-Metro Sewer releases. The measurement section is getting difficult to wade as it narrows down and moves. This is suspected to be due to the frequently changing, and increasing number of sand bars building both upstream as well as downstream of the control. As the measurement section changes to accommodate a favorable section, lag times may become an issue to consider since changes in stage vary so greatly during short periods of time. Further employment of weighted gage height determinations may become necessary. Station maintained and record developed by Jana Ash.
- Recommendations.-- Photos of the control at various high water stages would be helpful to determine the transition to channel control. These photos should be titled with the date and GH.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06720500 SOUTH PLATTE RIVER AT HENDERSON

RATING TABLE--

PLAHENCO33 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

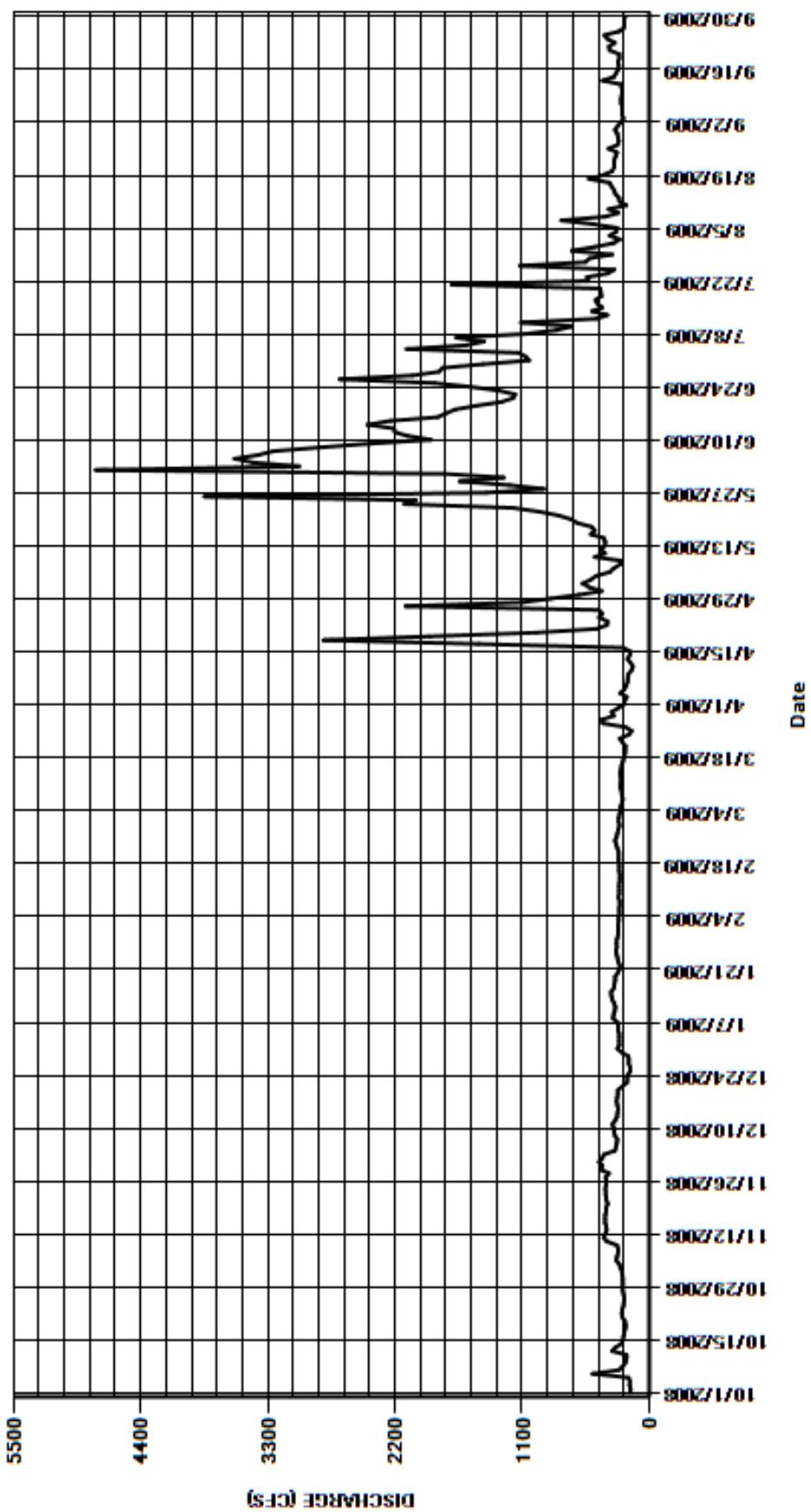
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	164	233	436	259	269	265	222	413	1770	1040	310	274
2	162	237	407	263	269	264	213	519	4790	1070	256	245
3	171	249	394	261	265	258	196	578	3030	1130	344	224
4	168	261	298	262	266	251	252	506	3430	2100	287	236
5	180	286	289	272	259	249	216	461	3590	1590	276	236
6	491	279	282	269	261	237	199	343	3380	1430	479	233
7	263	271	276	278	258	230	189	308	3250	1670	762	244
8	229	270	299	315	258	237	186	255	2840	1070	381	246
9	206	280	305	309	266	240	181	239	2410	803	267	240
10	198	367	309	299	261	251	155	472	1890	668	352	233
11	197	394	320	294	260	248	142	383	2090	1110	199	238
12	323	381	295	305	262	245	161	422	2200	458	257	244
13	292	370	279	322	259	248	189	384	2210	364	263	404
14	240	373	275	328	257	252	170	382	2440	496	294	305
15	229	384	270	331	255	245	164	392	2240	407	305	288
16	222	383	276	307	262	239	225	506	1830	449	327	267
17	217	382	283	303	262	228	1480	473	1760	465	345	265
18	208	373	278	296	263	220	2820	500	1680	414	522	271
19	204	373	273	297	264	211	1900	624	1500	421	400	259
20	213	360	274	274	265	209	977	679	1280	424	323	261
21	235	373	234	259	266	206	461	788	1180	1710	305	344
22	238	376	194	257	277	232	367	955	1160	526	306	350
23	235	378	192	269	287	257	362	1180	1300	540	303	298
24	224	381	187	276	297	177	435	2120	1550	360	291	361
25	220	374	165	284	283	153	407	2020	1860	303	279	388
26	217	373	165	287	276	205	437	3850	2680	1120	353	260
27	223	378	178	280	268	400	2110	1410	2050	553	275	219
28	229	349	176	284	258	410	1100	913	1820	516	265	218
29	228	420	183	279	---	307	855	1210	1790	321	270	220
30	228	405	240	271	---	328	609	1640	1440	671	278	206
31	229	---	277	269	---	272	---	1260	---	474	297	---
TOTAL	7083	10313	8309	8859	7453	7774	17380	26185	66440	24673	10171	8077
MEAN	228	344	268	286	266	251	579	845	2215	796	328	269
AC-FT	14050	20460	16480	17570	14780	15420	34470	51940	131800	48940	20170	16020
MAX	491	420	436	331	297	410	2820	3850	4790	2100	762	404
MIN	162	233	165	257	255	153	142	239	1160	303	199	206
CAL YR	2008	TOTAL	147647	MEAN	403	MAX	2810	MIN	131	AC-FT	292900	
WTR YR	2009	TOTAL	202717	MEAN	555	MAX	4790	MIN	142	AC-FT	402100	

MAX DISCH: 7200 CFS AT 14:30 ON Jun. 02,2009 GH 8.94 FT. SHIFT 0.21 FT.

MAX GH: 8.94 FT. AT 14:30 ON Jun. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06720500 SOUTH PLATTE RIVER AT HENDERSON
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
MIDDLE SAINT VRAIN AT PEACEFUL VALLEY
Water Year 2009

Location.--	Lat. 40 07' 55", Long. 105 31' 00", NE1/4 NW1/4 Sec. 24, T.2 N., R.73 W.
Drainage and Period of Record.--	Gage established on May 14, 1998 by State of Colorado, Division of Water Resources personnel. This gage will be a partial year record station.
Equipment.--	Graphical stage recorder, digital shaft encoder and Sutron 8210 Satellite Monitoring Data Collection Platform (DCP) in a 42-inch corrugated metal pipe shelter and 42-inch steel stilling well. The primary reference is a metal drop tape and adjustable reference point (RP) located on the equipment shelf of the shelter. No other supplemental references are available. On October 16, 2008 the Sutron 8210 DCP and Sutron 8500 SE were replaced with a Sutron Satlink 2 DCP and a Sutron 56-0540 SE.
Hydrographic Conditions.--	16.8 square miles of drainage, comprised wholly of uninhabited forested lands with varying topography. Gage is located in the Indian Peak Wilderness Area of Roosevelt National Forest, at the Peaceful Valley / Camp Dick United States Forest Service campground facilities. No known diversions occur upstream from the gage. Marked diurnal flow occurs during peak snowmelt months. Due to heavy winter conditions and the remoteness of this gage, year-round operation of the gage is not possible.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with graphical chart record as backup. The record is complete and reliable, except for the following periods: October 13-16, 22-24, 2008 and November 5-12, 2008 when the gage was affected by ice ; and, November 13, 2008 to May 10, 2009 when the gage was closed for winter and no gage-height information is available . Installation of the new DCP and shaft encoder October 16, 2008 resulted in missing data values. These values were estimated using GH data before and after the construction with consideration to ice affect as ice still remained in the channel. Artificially elevated stage values of .01 ft. to .02 ft. incurred by performing discharge measurements immediately downstream from the gage, when the Hydrographer was directly in front of the inlet. The affect is considered to be negligible to the record, but the measurement GH's were adjusted to the correct value.
Datum Corrections.--	Levels were run on October 16 and 31, 2008 and then again on October 14, 2009. On October 31, 2008 several new reference marks were added to the station: RM #1, RM #2, and RM #3. Levels run on October 16, 2008 were used to establish a new RP index for the gage as the instrument shelf was replaced on this date. Levels were not run prior to replacement of the instrument shelf. Therefore, the gage was assumed to be stable this year, and this assumption is supported from level history showing no movement in the base gage since 1998 when the gage was initially indexed. Levels run on October 31, 2008 were run to verify new RP index and establish additional reference marks (RM). The RP was discovered to be an average of 0.014 ft. low in elevation, no correction was made. When levels were run on October 14, 2009, the RP was discovered to be an average of 0.014 ft. low in elevation, no correction was made.
Rating.--	The control for low to moderate stages is a rock riffle approximately 15-feet downstream of the gage composed of embedded cobble and boulders. The high water control is a sharp bend and gradient change in the stream channel approximately 40-feet downstream for the gage. The low to moderate control is subject to shifting boulders moving in to and out of the control area as well as material embedding and being released from the rock riffle. Moss and debris accumulation is not an issue at this gage. Rating No. 4 in use since October 1, 2004 was continued this year. Rating No. 4 is defined by measurements from 4.6 to 176 cubic feet per second (cfs). Twelve discharge measurements (Nos. 87-99) were performed this year ranging in discharge from 4.41 to 260 cfs. Measurements made this water year cover the range in stage except for June, 27, 2009, where mean daily GH exceeded the highest measured GH by .03 ft. of stage. The peak flow of 346 cfs occurred at 2000 on June 26, 2009 at a stage of 3.39 feet with a shift of -0.19 ft. It exceeded measurement No. 94 made on June 27, 2009 by 0.17 feet of stage.
Discharge.--	Shifting control method was used all year. Unadjusted shifts ranged from +0.01 to -0.19 feet. Shifts were distributed by time from Oct 1, 2008 to Jun 9, 2009. Shifts were distributed by stage using two variable stage-shift relationships: MIDSTECOVST01, based on Msmt. Nos. 92-94, was applied from Jun 9-27, 2009, and MIDSTECOVST02, based on Msmt Nos. 94-99, applied from Jun 27 – Sep 30, 2009.
Special Computations.--	Discharge values during periods of ice effect were estimated from surrounding good record with consideration of temperature trends. This is a partial year record. No record was kept for the winter period (November 13, 2008 to May 10, 2009). Very few measurements have been made in the upper ranges in flow. The high water measurement that defines the peak was made from the downstream bridge where holiday traffic required the use of 20 second counts.
Remarks.--	The record is good except during periods when the gage was ice affected, which is estimated and fair. The instantaneous peak is rated fair due to lack of rating definition. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Efforts should be taken in continuation of upper end rating development as conditions allow. Peak diurnal stages and higher flow rates occur in late May to early June around 22:00 to 24:00 hrs and short in duration making rating development at high flows difficult. Levels should be run in the spring at the opening of the station to verify the discrepancy in the RP elevation. Levels should also be run annually for the next several years to verify stability of newly established reference marks.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MIDDLE SAINT VRAIN AT PEACEFUL VALLEY

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	5.4	---	---	---	---	---	---	196	118	41	15
2	13	5.4	---	---	---	---	---	---	170	122	39	15
3	13	5.5	---	---	---	---	---	---	150	144	40	14
4	13	5.3	---	---	---	---	---	---	174	130	37	14
5	12	3.9	---	---	---	---	---	---	168	119	35	13
6	12	4.1	---	---	---	---	---	---	166	107	39	14
7	11	4.5	---	---	---	---	---	---	148	98	39	13
8	9.6	4.5	---	---	---	---	---	---	125	94	37	13
9	9.4	4.5	---	---	---	---	---	---	124	89	33	13
10	9.1	4.5	---	---	---	---	---	---	127	82	30	13
11	9.2	4.5	---	---	---	---	---	40	130	78	28	12
12	9.6	4.5	---	---	---	---	---	51	124	88	27	13
13	7.5	---	---	---	---	---	---	58	127	80	27	14
14	6	---	---	---	---	---	---	56	129	78	26	12
15	6.5	---	---	---	---	---	---	66	130	76	26	11
16	7.5	---	---	---	---	---	---	80	126	68	25	11
17	8.1	---	---	---	---	---	---	96	131	62	22	12
18	7.8	---	---	---	---	---	---	119	141	60	21	12
19	7.5	---	---	---	---	---	---	147	144	57	20	11
20	7.6	---	---	---	---	---	---	177	144	54	19	11
21	8	---	---	---	---	---	---	173	153	55	19	12
22	6	---	---	---	---	---	---	155	150	56	19	11
23	6.5	---	---	---	---	---	---	146	161	51	20	10
24	6.9	---	---	---	---	---	---	145	159	48	23	9.8
25	6.9	---	---	---	---	---	---	178	160	47	22	9.5
26	6.5	---	---	---	---	---	---	183	218	48	20	8.5
27	6.2	---	---	---	---	---	---	144	275	48	19	7.5
28	5.9	---	---	---	---	---	---	140	181	48	18	7.3
29	5.7	---	---	---	---	---	---	158	150	46	17	7.1
30	5.6	---	---	---	---	---	---	167	131	51	17	7
31	5.4	---	---	---	---	---	---	179	---	46	16	---
TOTAL	263.0	56.6	---	---	---	---	---	2658	4612	2348	821	345.7
MEAN	8.48	4.72	---	---	---	---	---	127	154	75.7	26.5	11.5
AC-FT	522	112	---	---	---	---	---	5270	9150	4660	1630	686
MAX	14	5.5	---	---	---	---	---	183	275	144	41	15
MIN	5.4	3.9	---	---	---	---	---	40	124	46	16	7

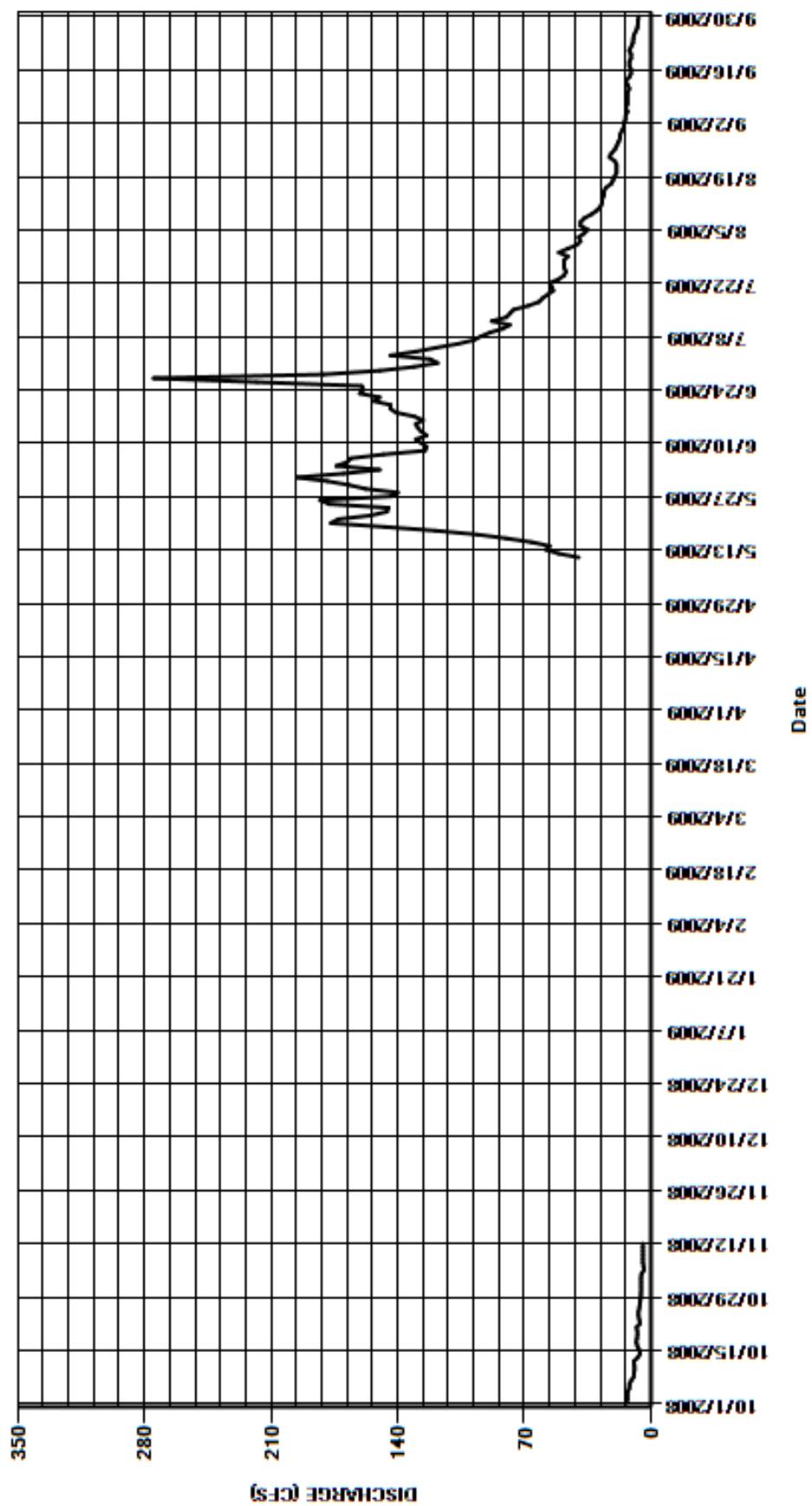
CAL YR	2008	TOTAL	10600.6	MEAN	59.6	MAX	204	MIN	3.9	AC-FT	21030	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	11104.3	MEAN	59.7	MAX	275	MIN	3.9	AC-FT	22030	(PARTIAL YEAR RECORD)

MAX DISCH: 346 CFS AT 20:00 ON Jun. 26,2009 GH 3.39 FT. SHIFT -0.19 FT.

MAX GH: 3.39 FT. AT 20:00 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MIDDLE SAINT VRAIN AT PEACEFUL VALLEY
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06722500 SOUTH SAINT VRAIN NEAR WARD
Water Year 2009

Location.-- Lat. 40°05'27", Long. 105°30'50"

Drainage and Period of Record.-- 14.4 mi²; 1925-27, 28-31, 54-73, 1992 to present.

Equipment.-- Graphical water stage recorder, and digital shaft encoder (SE) connected to a Sutron Satlink data collection platform (DCP) in a 42-inch diameter corrugated metal pipe shelter and well. The primary reference is a metal drop tape from an adjustable reference point (RP) located on the equipment shelf of the shelter. No other supplemental references are available.

Hydrographic Conditions.-- Drainage area is 14.3 sq mi from topographic maps (RMNP quad.). Drainage is virtually uninhabited forested lands up to the continental divide, with no artificial diversions. This site is commonly used for watershed studies. The gage is approximately 3.5 miles downstream from Brainard Lake, a naturally occurring water body. Water passing this gage is diverted into the Lefthand Creek basin about 1/3 mile downstream, at the Lefthand Ditch Diversion (LEFTHDCO). Normally the entire flow is diverted up to the point where it spills over the Lefthand diversion structure. So the two gages report similar, if not identical, discharges. However, the high flow point when water bypasses LEFTHDCO is not well defined. Measurements made at this gage are sometimes also used for flow at the Lefthand gage, when it is observed that 100% is being diverted.

Gage-Height Record.-- The primary record is hourly averages of 15-minute telemetered data with graphical chart record as backup. The record is complete and reliable, except for the following periods: November 5-12, 2008, when the gage was frozen; November 13, 2008 to May 10, 2009, when the gage was closed for winter and no gage-height information is available; May 11, 2009, partial day record. The encoder held calibration all year. No datum corrections were required. One control correction was required as follows: Work on the control was done on September 1, 2009. The channel was cleaned of a few large boulders and the control was fortified with more cobble. The result was a +0.02 ft. rise in gage height. Measurement no. 199 was performed prior to the control work resulting in a -0.03 shift. Measurement no. 200 was performed after the channel work resulting in a -0.05 ft. shift. The shifts compensate for the rise in gage height from the control work.

Datum Corrections.-- Levels were run on October 14, 2009. RP was found to be 0.014 ft. high. No correction was made.

Rating.-- The control for low to moderate flow is a rock riffle composed of embedded river boulders approximately 30-feet downstream from the shelter. The high water control is a sharp bend and gradient change in the stream channel approximately 50-feet downstream of the gaging station. The control is subject to shifting boulders moving into and out of the control area as well as material embedding and being released from the rock riffle. Moss growth and debris accumulation is generally not an issue at this gage; however fill and scour conditions as well as control movement do occur. Rating No. 11 developed in water year 2007 is defined by measurements from 4.74 to 156 cubic feet per second (cfs). The rating was extended this year to 510 cfs to include a 2009 measurement of 317 cfs. Twelve measurements (Nos. 190-201) were performed this year ranging in discharge from 4.68 cfs to 317 cfs. They cover the range of stage experienced except for peak days June 26-27. The peak discharge of 494 cfs occurred at 2315 on June 26, 2009 at a stage of 3.20 feet with a shift of +0.08 ft. It exceeded measurement No. 195 made on June 27, 2009 by 0.24 feet of stage.

Discharge.-- Shifting control method was used all year. Unadjusted shifts ranged from -0.08 feet to +0.02 feet. All measurements were given full weight unless specified differently below. Shifts were distributed by time and by stage. Shifts were distributed by time as follows: Oct 1-Nov 12, 2008, (Nov 12, 2008 – May 11, 2009 – Gage off for winter season), and May 11-26, 2009. Measurement 192 (May 26) was adjusted 3% to smooth transition between time and stage shifting. Shifts were distributed by stage using two variable stage shift relationships: SSVWARCOVST01, applied May 26 – Sept 1, 2009 and based on measurements made during the period. Measurement 194 (June 24) was adjusted 8% to better fit with measurement 195. Measurement 194 was made under poor conditions and was rated fair. Measurement 195 (June 27) was also a fair measurement, but was not adjusted as it is the highest measurement ever made at this gage. And, SSVWARCOVST02, applied Sept 1-30, 2009. The second table was necessary to compensate for work done on the control on September 1.

Special Computations.-- Discharges for November 5 thru 12, 2008 were estimated using values from the downstream station, LEFTHDCO. Discharge for May 11, 2009 was estimated from partial day record. This is a partial year record. No record was kept for the winter period (November 13, 2008 to May 10, 2009).

Remarks.-- The record is good except for periods of no gage height record and ice affected record, which are estimated and poor. The peak is rated as estimated and poor since it is higher than 150% of the highest measurement of 317 cfs. Station maintained and record developed by Patrick Tyler.

Recommendations.-- Defining high flows remains a problem. High water measurements at or above 140 cfs cannot be waded. Crane measurements off the bridge at the gage are difficult and poor due to turbulence caused by a constriction at the bridge abutments, high velocities, and debris firmly lodged in the channel bed at the bridge section. Due to the remoteness of this gage, efforts to find a more suitable measurement location have been unsuccessful. Moreover, under high water conditions measurement at LEFTHDCO is not an option due to diversion practices and supercritical velocities encountered at the only available cabling location due to the LEFTHDCO structure lay out. The cabling section at this gage should be improved prior to high flow and the intakes shortened to avoid possible drawdown effects.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06722500 SOUTH SAINT VRAIN NEAR WARD

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.2	4.6	---	---	---	---	---	---	157	116	42	14
2	7.1	4.5	---	---	---	---	---	---	149	112	36	13
3	7.1	4.8	---	---	---	---	---	---	112	135	35	13
4	7.2	4.3	---	---	---	---	---	---	125	128	34	12
5	7.4	3.1	---	---	---	---	---	---	137	118	32	12
6	7.1	2.3	---	---	---	---	---	---	135	103	32	12
7	6.2	2.6	---	---	---	---	---	---	128	92	33	11
8	6.1	2.6	---	---	---	---	---	---	97	88	32	11
9	5.5	1.9	---	---	---	---	---	---	89	85	30	11
10	5.5	1.5	---	---	---	---	---	---	95	78	27	9.2
11	5.7	1.3	---	---	---	---	---	25	99	66	25	7.1
12	6.7	1.3	---	---	---	---	---	29	87	77	25	6.8
13	6.4	---	---	---	---	---	---	33	91	73	43	7.7
14	6.3	---	---	---	---	---	---	32	108	67	44	7
15	5.9	---	---	---	---	---	---	37	119	68	43	6.3
16	5.7	---	---	---	---	---	---	43	108	61	41	5.9
17	5.3	---	---	---	---	---	---	51	116	57	39	5.8
18	5.3	---	---	---	---	---	---	62	137	55	38	5.4
19	4.9	---	---	---	---	---	---	79	144	55	36	5.2
20	4.9	---	---	---	---	---	---	104	153	54	34	5.3
21	5.7	---	---	---	---	---	---	129	152	54	33	7.2
22	5	---	---	---	---	---	---	114	158	53	32	7.3
23	6.4	---	---	---	---	---	---	101	173	47	31	7
24	6.3	---	---	---	---	---	---	96	171	43	31	7.3
25	5.8	---	---	---	---	---	---	115	187	42	31	7.1
26	5	---	---	---	---	---	---	113	260	41	29	6.9
27	4.9	---	---	---	---	---	---	81	300	39	28	5.9
28	4.8	---	---	---	---	---	---	75	181	39	26	4.8
29	4.7	---	---	---	---	---	---	85	146	38	24	4.8
30	4.7	---	---	---	---	---	---	111	128	45	19	4.9
31	4.4	---	---	---	---	---	---	114	---	57	16	---
TOTAL	181.2	34.8	---	---	---	---	---	1629	4242	2186	1001	243.9
MEAN	5.85	2.9	---	---	---	---	---	77.6	141	70.5	32.3	8.13
AC-FT	359	69	---	---	---	---	---	3230	8410	4340	1990	484
MAX	7.4	4.8	---	---	---	---	---	129	300	135	44	14
MIN	4.4	1.3	---	---	---	---	---	25	87	38	16	4.8

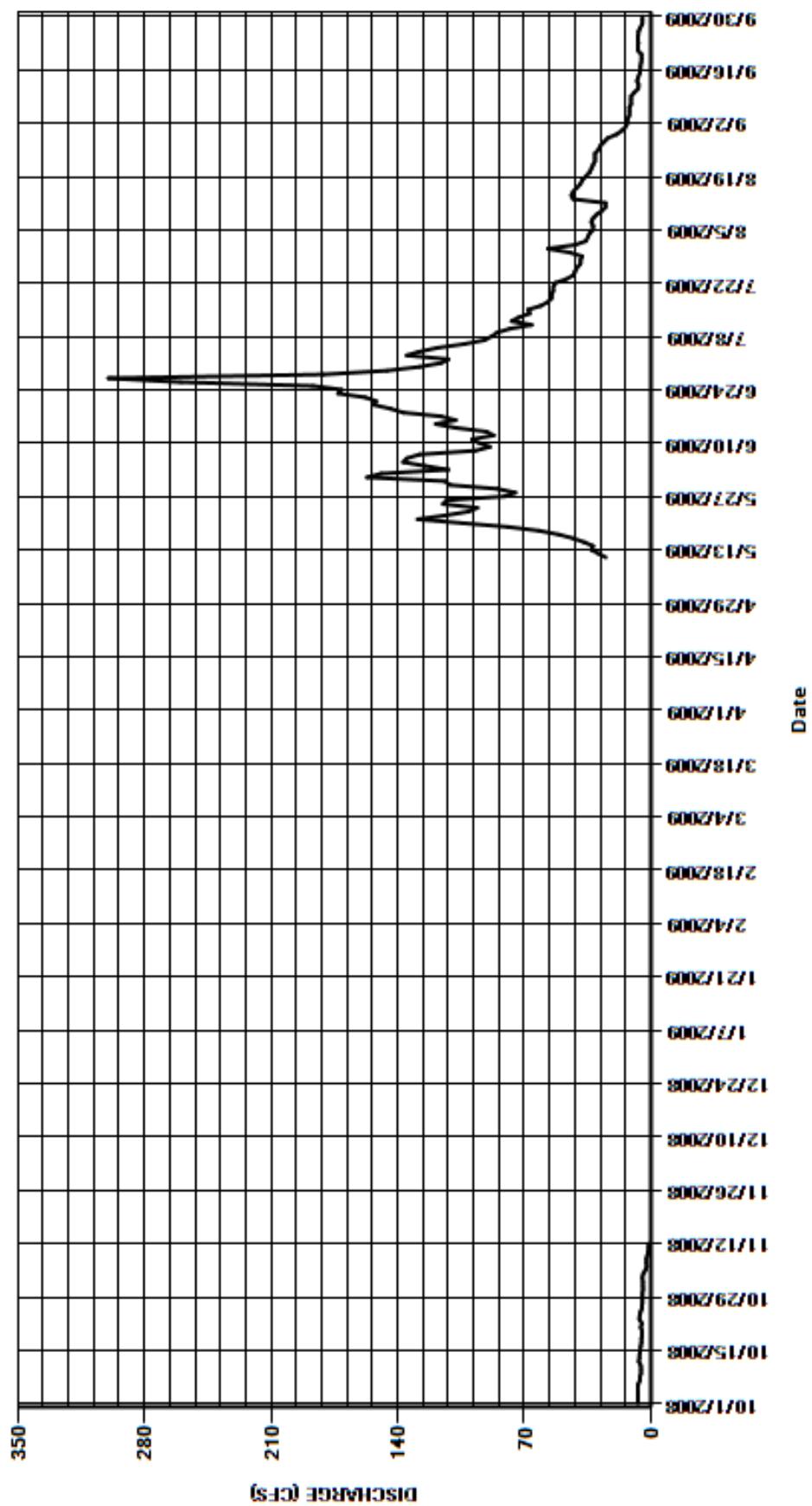
CAL YR	2008	TOTAL	8812.3	MEAN	49.5	MAX	144	MIN	1.3	AC-FT	17480	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	9517.9	MEAN	51.2	MAX	300	MIN	1.3	AC-FT	18880	(PARTIAL YEAR RECORD)

MAX DISCH: 494 CFS AT 23:15 ON Jun. 26,2009 GH 3.2 FT. SHIFT 0.08 FT.

MAX GH: 3.2 FT. AT 23:15 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**06722500 SOUTH SAINT VRAIN NEAR WARD
WY2009 HYDROGRAPH**



PLATTE RIVER BASIN
LEFT HAND DIVERSION NEAR WARD
Water Year 2009

Location.--	Lat. 40°05'29", Long. 105°30'31", the gage is located ½ mile downstream from gage on S. St. Vrain Creek off Highway 72.
Drainage and Period of Record.--	Established station on May 21, 1992 at request of Water Commissioner for administration of water rights in District 5, Div. 1. The gage is located one-quarter mile downstream from gage on South Saint Vrain Creek off Highway 72. This station is operated as a partial year record station usually from May to October.
Equipment.--	Graphic water stage recorder and digital shaft encoder (SE) connected to a Sutron Satlink data collection platform (DCP) in a 36-inch diameter corrugated metal pipe shelter and 42-inch concrete well. The well is connected to the channel with two two-inch polyvinyl conduit (PVC) inlets. The PVC inlets are equipped with ball valves, street keys and flushing risers. The primary reference is a metal drop tape from an adjustable reference point (RP) located on the equipment shelf of the shelter. No other supplemental references are available.
Hydrographic Conditions.--	Semi-regulated diversion point. This gage measures water diverted from the South Saint Vrain Creek into James Creek and thence to Lefthand Creek in the Boulder Creek water shed. Diversions usually encompass the entire flow of the South Saint Vrain Creek at this point. The area listed for the upstream gage (South Saint Vrain Near Ward, CO (SSVWARCO)) is 14.3 sq mi consisting of virtually uninhabited forested lands. The SSVWARCO gage is approximately 3.5 miles below Brainard Lake and approximately 0.4 miles above the Left Hand Diversion at South Saint Vrain Creek (LEFTHDCO) gage. The LEFTHDCO diversion structure is comprised of a concrete diversion dam, and a 10-foot wide radial gate with trash rack located approximately 55-feet upstream from the control. The radial gate is operated in such a way that it is under pressure for a majority of the season creating a somewhat regulated diversion. Due to this operational regime, peaks and troughs encountered by the SSVWARCO gage can be somewhat attenuated at this gage. Some inflow is expected to occur between the SSVWARCO and LEFTHDCO gage during runoff and storm events which accounts for some computational differences. Travel time between gages is approximately 30 min, therefore minimal time lag effect.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with graphical chart record as backup. The record is complete and reliable except for the following periods: November 6-12, 2008, suspected ice effect; November 13, 2008 to May 10, 2009, gage was closed for winter, and no gage-height information is available; Nov 12 and May 11, gage turned off/on for season, partial day records. Missing data from the primary data set due to DCP failure was filled in with graphical chart record and with correlation from the upstream station at SSVWARCO without loss of accuracy on the following days: October 22-31, 2008 and June 6- 9, 2009. Instrument agreement was good (+/- 0.02 feet) between the primary data set and the backup chart record for this period. Flows above approximately 90 cfs cannot be measured at the gage, therefore high water measurements must be made upstream at SSVWARCO and applied to LEFTHDCO. However, the 2009 peak flow measured at the upstream station showed a large positive shift when applied to LEFTHDCO. This calls to question whether the measurement GH at LEFTHDCO could have been affected by gate operation, or adverse hydraulics at the inlets (drawdown, standing wave , etc.). Velocities are high past the gage and inlet drawdown has been speculated as a source of GH irregularity.
Datum Corrections.--	Levels were last run on October 14, 2009. The RP was found to be 0.008 ft. high, so no correction was needed.
Rating.--	The control is a broad crested concrete dam approximately 10 feet below the gage shelter. Moss and debris accumulation is generally not an issue at this gage however; larger debris such as tree limbs can catch on the control. Rating No. 3 in use since October 2005 was used again this water year. It was extended this year to include 2009 Measurement 143, the highest measurement recorded at this gage. Eleven measurements (Nos. 138-148) were performed this year ranging in discharge from 4.68 cfs to 316 cfs. They cover the range experienced. Measurement Nos. 140 and 142-144 were made at the SSVWARCO gage, when flow rates were above wadeable limits at LEFTHDCO, and applied to this gage. The peak flow of 318 cfs occurred at 0915 June 27 at a gage height of 2.33 ft with a shift of +0.37 ft. It exceeded measurement 143, made June 27, by 0.05 ft.
Discharge.--	Shifting control method was used all year. SSVWARCO and LEFTHDCO are in such close proximity to each other that discharges should be quite consistent. When the gages are individually measured, measurements may be adjusted in order to have a good trend between the two stations. In 2009, Measurement Nos. 139-141 and 146 and 147 were adjusted between -5 and 4% to achieve this. Measurement 142, made at SSVWARCO, was adjusted for the SSVWARCO record to show more water to be consistent with the high measurement. No 142 was similarly adjusted for the LEFTHDCO record. Shifts were applied by time and stage. Shifts were distributed by time from Oct 1, 2008 - May 11, 2009. Shifts were applied by stage using variable stage shift relationship LEFTHDCOVST01 from May 12 to the end of the water year.
Special Computations.--	A spreadsheet was used to compare computed discharges with the upstream gage, SSVWARCO. When LEFTHDCO was diverting the entire flow, measurements applied from SSVWARCO were applied to LEFTHDCO, and were confirmed by field observation. Care was taken to adjust measurements applied from SSVWARCO in the same direction and amounts that were used in the development of the SSVWARCO record. Comparison of the final record with that of SSVWARCO revealed that daily discharges diverged 10% or more during the peak days, namely June 22-27, and July 2, 3. This is a partial year record. No record was kept for the winter period (November 13, 2008 to May 10, 2009).
Remarks.--	The record is good except periods of ice effect and partial record, which are estimated and fair. June 22-27, and July 2, 3 are fair due to poor rating definition. The instantaneous peak of 318 cfs is considered fair. Station maintained and record developed by Patrick Tyler.
Recommendations.--	

High flow measurements are difficult and dangerous to perform at this gage as well as the SSVWARCO gage and are often poor. Due to the remoteness of these gages, other locations for performing high water measurements are not possible. If a bank operated cableway were installed at the SSVWARCO gage, some resolution of these issues may occur. That said, another measurement in the 200-300 cfs range would be very helpful in building a new rating. Such a measurement would need to incorporate observations about gate operation and GH reliability. A staff on the gate pool might help. Rtg. 3 had been extended to 296 cfs based on a high measurement of 156 cfs made in 2006. However, the new high measurement of 316 cfs had a very high shift (+0.37), indicating that the previous extension may not have been accurate. A new rating may be in order if Msmt. No 143 is validated in the future by a similar high flow measurement with a reliable GH.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LEFT HAND DIVERSION NEAR WARD

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.5	4.3	---	---	---	---	---	---	145	97	42	14
2	7.5	4.3	---	---	---	---	---	---	138	111	36	13
3	7.5	4.7	---	---	---	---	---	---	110	162	35	13
4	7.5	4.2	---	---	---	---	---	---	119	144	34	13
5	7.7	3.1	---	---	---	---	---	---	129	123	32	13
6	7.6	2.3	---	---	---	---	---	---	128	101	32	13
7	6.8	2.6	---	---	---	---	---	---	124	87	33	12
8	6.6	2.6	---	---	---	---	---	---	100	83	32	12
9	5.6	1.9	---	---	---	---	---	---	90	81	29	12
10	5.8	1.5	---	---	---	---	---	---	94	73	26	10
11	5.9	1.3	---	---	---	---	---	25	100	63	24	8.2
12	6.8	1	---	---	---	---	---	28	66	71	24	7.9
13	6.6	---	---	---	---	---	---	32	61	69	42	8.8
14	6.6	---	---	---	---	---	---	31	106	64	43	8.1
15	6	---	---	---	---	---	---	35	109	64	43	7.4
16	5.8	---	---	---	---	---	---	42	101	59	41	7.3
17	5.2	---	---	---	---	---	---	49	108	55	39	7
18	5.2	---	---	---	---	---	---	60	132	53	37	6.7
19	4.7	---	---	---	---	---	---	77	140	52	35	6.4
20	4.5	---	---	---	---	---	---	100	147	52	34	6.4
21	5.6	---	---	---	---	---	---	121	143	51	33	8
22	5.4	---	---	---	---	---	---	109	146	51	32	8.2
23	6.7	---	---	---	---	---	---	98	155	47	31	8
24	6.3	---	---	---	---	---	---	93	156	43	31	8.1
25	5.8	---	---	---	---	---	---	111	165	42	30	8.1
26	4.9	---	---	---	---	---	---	110	216	41	29	7.9
27	5.8	---	---	---	---	---	---	82	162	39	27	6.9
28	4.9	---	---	---	---	---	---	78	83	38	26	5.5
29	4.5	---	---	---	---	---	---	87	80	37	24	5.6
30	4.5	---	---	---	---	---	---	110	79	44	19	5.7
31	4.5	---	---	---	---	---	---	113	---	55	16	---
TOTAL	186.3	33.8	---	---	---	---	---	1591	3632	2152	991	271.2
MEAN	6.01	2.82	---	---	---	---	---	75.8	121	69.4	32	9.04
AC-FT	370	67	---	---	---	---	---	3160	7200	4270	1970	538
MAX	7.7	4.7	---	---	---	---	---	121	216	162	43	14
MIN	4.5	1	---	---	---	---	---	25	61	37	16	5.5

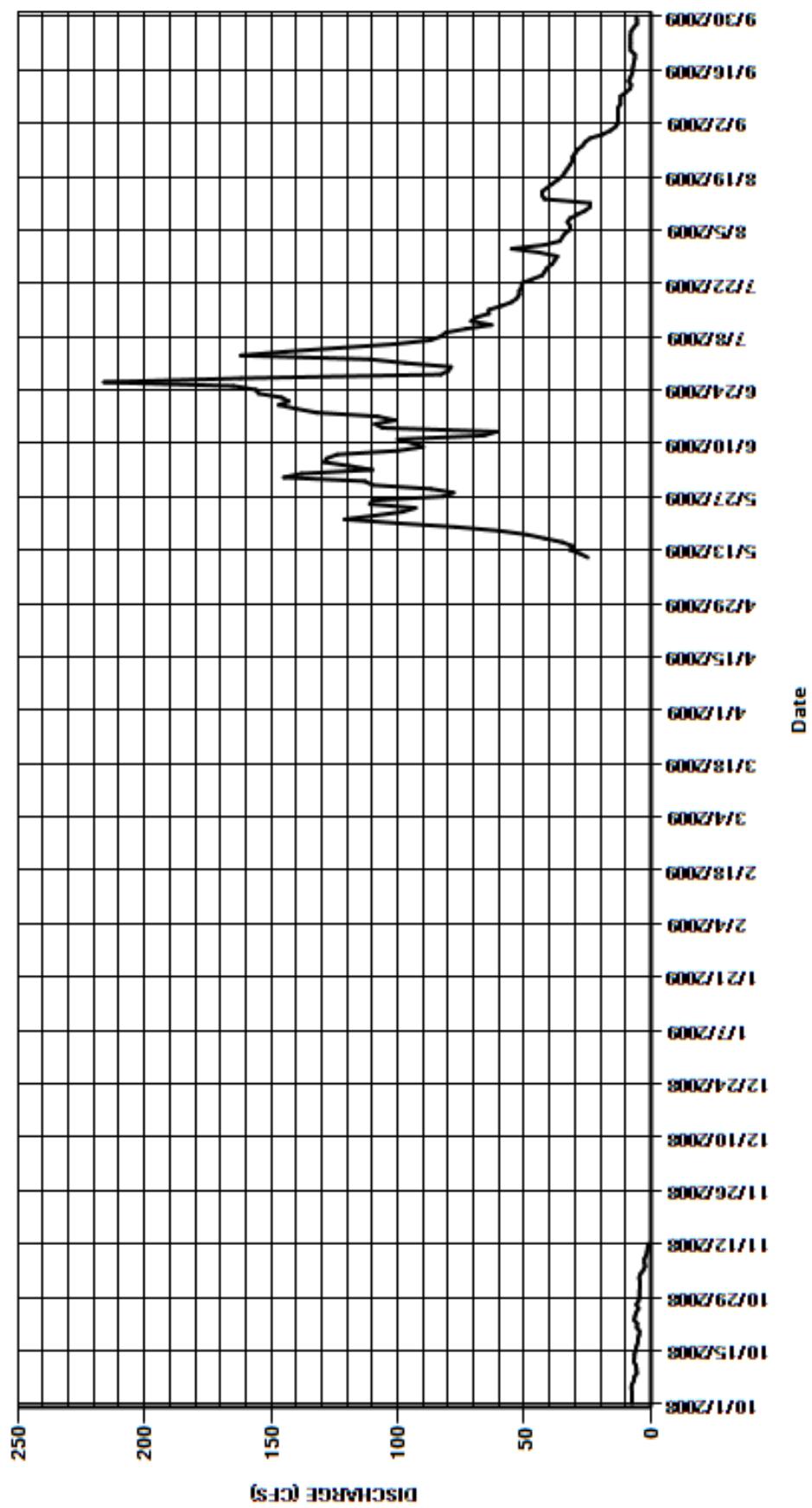
CAL YR	2008	TOTAL	8690.2	MEAN	48.8	MAX	150	MIN	1	AC-FT	17240	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	8857.3	MEAN	47.6	MAX	216	MIN	1	AC-FT	17570	(PARTIAL YEAR RECORD)

MAX DISCH: 318 CFS AT 09:15 ON Jun. 27,2009 GH 2.33 FT. SHIFT 0.37 FT.

MAX GH: 2.33 FT. AT 09:15 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LEFT HAND DIVERSION NEAR WARD
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06724000 SAINT VRAIN CREEK AT LYONS, CO
Water Year 2009

Location.-- Lat. $40^{\circ}13'05''$, Long. $105^{\circ}15'34''$, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.3 N., R.70 W., Boulder County, Hydrologic Unit 10190005, on left bank 75 ft southwest of U.S. Highway 36 (State Highways 7 and 66) at southeast edge of Lyons, 400 ft upstream from St. Vrain Supply Canal, and 0.4 mi downstream from confluence of North and South St. Vrain Creeks.

Drainage and Period of Record.-- 212 mi². Aug. 1887 to Sep. 1891, June 1895 to current year. Monthly only data for some periods. Water quality data available from Oct. 1977 to Feb. 1981. On March 23, 2003, the gage was moved approximately 0.2 mi upstream. In the new location, the gage is above the Supply Ditch diversion, whereas the old location was below this diversion.

Equipment.-- Graphical water stage recorder and an incremental shaft encoder connected to a high data rate Data Collection Platform (DCP) in a 6-foot by 6-foot wooden shelter* with 42-inch precast concrete stilling well upstream of a low head concrete diversion dam. An Electric Tape Gage (ETG) located on the instrument shelf is the primary reference with a supplementary cantilever chain gage located 10 feet downstream of the shelter. The stilling well is connected to the channel via four 2-inch inlets, three of which are equipped with valves and flushing equipment. A secondary shaft encoder is installed on the instrument shelf of the shelter. This shaft encoder is used for the Highland Ditch Company's Supervisory Control and Data Acquisition (SCADA) system. This instrument is maintained by the Colorado Division of Water Resources (DWR) and operated such that the instruments stage reading is set to the base gage stage plus or minus last measured shift. *On May 27, 2009 the timber shelter was replaced with a 6-foot by 6-foot exposed aggregate precast concrete building .

Hydrographic Conditions.-- 216 square miles of drainage from USGS topographic maps; mainly comprised of forested and grassy areas with varying topography. Gage is located below the confluence of the south and north forks of the Saint Vrain and below most of Lyons Colorado. Beaver Creek and Button Rock Reservoirs are upstream of this gage as well as numerous other diversions of varying magnitude. This station is susceptible to rapid increases in stage due to storm runoff events from hardened surfaces within the Town of Lyons, CO.

Gage-Height Record.-- The primary record is hourly averages of telemetered 15-minute data with chart record as backup. Frequent visits show good agreement between primary and backup records, and the ETG. No flush corrections or inlet plugging events occurred this year. However, debris accumulation on the diversion dam was a problem. Accumulated debris was removed from the control on April 6, 2009 resulting in a -0.02 foot change to the gage-height. Otherwise, the gage-height record is complete and reliable except: December 4,5 and 10-13, 2008, February 28, 2009, March 1, March 11-14 and 26-28, 2009, when ice affected the stage-discharge relationship; May 27, 2009, when the gage was offline for 14 hours for shelter replacement and no gage-height information available; and June 3 to 23, 2009, when there was debris accumulation on control, unspecified date debris was accumulated and shed. The gage was closed for the winter from December 14, 2008 to February 25, 2009.

Datum Corrections.-- Prior to the shelter replacement, levels were last run on September 22, 2006 and found to be within allowable tolerances. Levels were run on May 28 on the new shelter. At that time the gage datum was misinterpreted and the gage was set to read 1.08 ft higher than previously. Levels were run again on September 22, and the gage was found to be reading 1.09 ft high. A correction of -1.09 ft. correction was applied to the record and measurement GH's from the June 8 measurement to the time of the correction on September 22. A correction of -1.08 ft. was applied to the May 28 record and measurement GH. Between May 28 and June 8, the correction was prorated from -1.08 to -1.09 ft. The 0.01 ft difference was presumed to be due to settling of the shelter on the sealer used between the shelter and the floor. The gage datum was restored to 5301.080 feet following the September 3, 2009 levels circuit.

Rating.-- The control for low to mid level stages is a low-head concrete diversion dam for the Supply Ditch approximately 570 feet below the gage. At higher stages the gage reverts to channel control; which, has not been fully defined since the gage was relocated in 2003. The diversion dam and ditch check structure approximately 1000 feet below the gage can gather debris and cause back water conditions at the gage under certain operational circumstances. Fill and scour conditions as well as debris accumulation on the low water control contributed to shifting away from the rating. Rating No. 25 in use since October 1, 2007 is defined by measurements from 11.8 to 976 cubic feet per second (cfs). Twenty-five measurements (Nos. 549-573) were performed this water year ranging in discharge from 21.1 to 758 cfs. Six measurements (Nos. 561-564, 566, 567) were performed with a Teledyne RD Instruments StreamPro Acoustic Doppler Current Profiler (ADCP). Measurements made this water year cover the range in stage experienced this year well. The peak discharge of 890 cfs occurred at 0515 June 27, 2009 at a gage height of 3.45 feet (datum correction of -1.09 feet applied) with a shift of -0.05 ft. It exceed the stage of Measurement No. 566 by 0.41 ft.

Discharge.-- Shifting control method was used this year. Unadjusted shifts ranged from 0.06 to -0.09 feet. Shifts were applied as follows: October 1 through December 14, 2008: time dependent shifting as defined by Msmt. Nos. 548-551; February 25 through April 21, 2009: time dependent shifting as defined by Msmt. Nos. 555-557; April 21 through June 3, 2009: stage dependent shifting utilizing variable shift table SVCLYOCOVS09-01, which is based of nine measurements (Nos. 557-560, 564-567). Nos. 557-560 were performed during the period of use and Nos. 564-567 were performed following the period of use but were evaluated to better define the upper regions of the table. during the period June 3 through June 23, 2009. Time dependent shifting as defined by Msmt. Nos. 560-564. Nos. 561-563 were performed on June 8, 2009 using the ADCP instrument. Nos. 561 and 562 were adjusted 1% and -2% to a measurement series mean shift of +0.05 feet. The measurements verified a relatively large positive shift change from the preceding and following measurements and associated stage-shift tables. This shift was conjectured to be due to siphonic action at the control, possibly involving light debris accumulation between the May 28 and June 23 measurements. June 3 was taken to be the end point for the previous table and the beginning of time shifting to the June 8 measurement shifts, since June 3 saw a significant stage rise. June 23 through September 18, 2009; stage dependent shifting utilizing variable shift table SVCLYOCOVS09-02, which is based on ten measurements (Nos. 564-573) made during the period of use. Nos. 564, 565, 567, 568, 571 were adjusted 15, -5%, 4%, -1% and -2% respectively to better fit the shift distribution September 18 through the end of the water year: time dependent shifting as defined by Msmt. Nos. 573-574 .

Special Computations.--	Discharge values for the estimated ice days and the winter period (December 14, 2008 to February 25, 2009) were derived from three discharge measurements (Nos. 552-554) made during the period, NWS Loveland, CO temperature data, as well as temperature data logged at this gage (SVCLYOCO). Computed record was used for days of possible ice--December 4, 10-13, 2008; February 28; March 1, 11-14, 2009. Discharge for May 27 was estimated from a total of 10 hours of good record in the morning and late evening. A digital hydrograph is included.
Remarks.--	The record is good except for periods of ice effect and no gage height record which are estimated and considered poor due to ice and winter station closure. December 4, and 10-13, 2008, February 28, March 1, and March 11-14 are considered fair due to possible ice effect. The period June 3-23, 2009 is considered fair due to debris on the control. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	<p>Special care needs to be taken when performing Current Meter Bank Operated Cableway (CM BOC) measurements. CM BOC measurements are often difficult to sound correctly and may introduce error into the measurement. Therefore, measurement rating is important. Verification of high flows from downstream diversions may be considered in the future.</p> <p>Use of the Bank Operated Cableway apparatus for ADCP measurements worked better than expected. Continued use of this equipment combination is highly recommended. Control conditions should be examined closely in the event of unexpected shifting. Levels need to run in the 2010 water year to monitor any subsequent settling of the new shelter. The addition of one to two additional reference marks is highly recommended. Communication with the Town of Lyons concerning their future white water park enhancements (existing upstream and downstream of the gage location) are imperative due to the proximity to the gage.</p>

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06724000 SAINT VRAIN CREEK AT LYONS, CO

RATING TABLE--

SVCLYOCO25 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

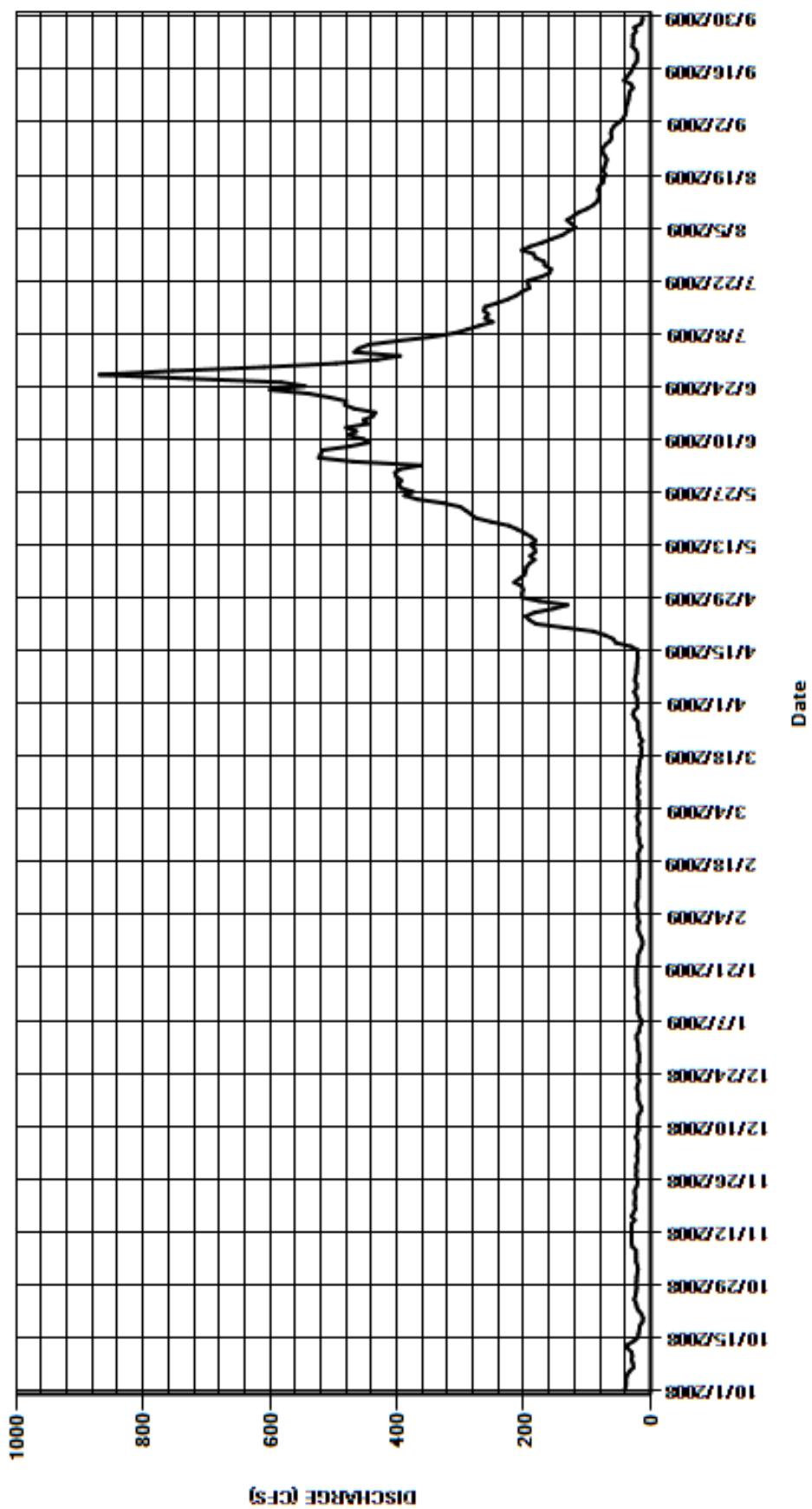
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	21	20	20	20	20	22	201	403	431	171	57
2	39	20	22	22	18	22	21	203	395	395	156	49
3	39	21	21	22	20	19	23	215	361	467	139	43
4	39	23	20	18	20	19	26	207	469	460	130	40
5	37	23	20	18	20	19	22	199	523	444	118	39
6	33	23	21	15	22	19	22	197	520	397	125	39
7	27	23	23	15	22	21	25	196	518	346	132	36
8	28	29	21	18	20	19	24	191	475	310	122	35
9	30	30	19	20	20	19	22	183	446	289	114	34
10	29	30	21	20	20	21	22	190	453	270	100	33
11	30	30	20	20	20	19	21	182	478	249	90	28
12	36	30	20	20	20	21	21	183	464	261	84	31
13	36	30	19	22	20	20	20	189	480	256	81	42
14	26	30	15	20	18	19	21	181	446	263	81	37
15	20	25	15	20	18	19	20	188	453	261	83	32
16	19	30	18	22	18	17	31	198	438	242	81	29
17	18	27	20	22	18	17	55	210	434	225	75	26
18	17	24	20	22	18	14	59	223	467	212	74	22
19	13	25	20	22	20	15	72	251	482	203	71	21
20	12	25	22	22	20	14	90	275	480	191	75	21
21	14	24	20	22	18	17	136	283	506	193	73	23
22	19	25	18	20	15	13	181	291	539	193	71	29
23	22	25	20	20	18	17	191	300	600	172	69	28
24	23	22	20	20	18	18	197	327	545	159	72	28
25	26	20	20	18	20	20	183	368	583	157	76	28
26	24	22	20	15	20	20	153	388	729	167	76	23
27	23	23	18	13	20	20	131	375	869	168	71	26
28	22	22	18	13	18	25	175	394	753	182	64	15
29	23	23	18	15	---	28	203	397	610	184	61	13
30	22	22	20	18	---	26	203	393	496	203	63	13
31	22	---	20	20	---	20	---	401	---	190	61	---
TOTAL	809	747	609	594	539	597	2392	7979	15415	8140	2859	920
MEAN	26.1	24.9	19.6	19.2	19.2	19.3	79.7	257	514	263	92.2	30.7
AC-FT	1600	1480	1210	1180	1070	1180	4740	15830	30580	16150	5670	1820
MAX	41	30	23	22	22	28	203	401	869	467	171	57
MIN	12	20	15	13	15	13	20	181	361	157	61	13
CAL YR	2008	TOTAL	34105.0	MEAN	93.2	MAX	516	MIN	8	AC-FT	67650	
WTR YR	2009	TOTAL	41600	MEAN	114	MAX	869	MIN	12	AC-FT	82510	

MAX DISCH: 890 CFS AT 05:15 ON Jun. 27,2009 GH 3.45 FT. SHIFT -0.05 FT. (DATUM CORRECTION OF -1.09 FT APPLIED)

MAX GH: 3.45 FT. AT 05:15 ON Jun. 27,2009 (DATUM CORRECTION OF -1.09 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06724000 SAINT VRAIN CREEK AT LYONS, CO
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06725500 MIDDLE BOULDER CREEK AT NEDERLAND
Water Year 2009

Location.-- Lat. 39°57'42", Long. 105°30'14", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T.I S., R.73 W., Boulder County, Hydrologic Unit 10190005, on left bank at Nederland just downstream from North Beaver Creek at inlet to Barker Reservoir.

Drainage and Period of Record.-- 36.2 mi². June 1907 to present.

Equipment.-- Graphic water-stage recorder and Sutron High Data Rate (HDR) data collection platform (DCP) with shaft encoder in timber shelter and concrete well at a sharp-crested Cipolletti weir with overflow rectangular crests and outside staff gage. City of Boulder maintains gage and chart recorder.

Hydrographic Conditions.-- The drainage area consists of 39.2 sq mi (from DWR dam safety data base), and the gage elevation is about 8200 ft. The drainage is undeveloped forest and continental divide watershed. There are few diversions and only small effects from the town. The channel is rock and cobble and is straight for about 250 ft upstream of the gage. During the winter, ice forms complete cover over the creek and weir for short periods from November to March.

Gage-Height Record.-- Primary record is hourly averaged 15-minute telemetered data with chart backup. Record is complete and reliable, except for the following days: October 22-23, November 15-16, 21-24, 28, December 5, 9-10, 15-22, 27-29, 2008, January 4-8, 10-12, 20-21, 26-30, February 9-15, 20-22, March 24-30, 2009 when the stage discharge relationship was affected by ice. Two large corrections occurred when material was removed from the control. The magnitude of the corrections and the uncertainty of the distributions makes the GH's less reliable for these periods: May 14-19, 2009: a -0.18 ft. correction for log jam which released on a rising stage on May 19. A step-rise on May 14 of +0.07 ft. was presumed to have initiated the jamming. So a -0.07 ft correction on May 14 was pro-rated to the -0.18 ft correction seen on May 19. July 30—August 18, 2009 a -0.10 ft. correction for board removal on August 18. No step rises of 0.10 ft were seen in the record preceding August, but an irregular rise of that magnitude occurred on July 30. The entire -0.10 ft correction was applied July 30—August 18. An instrument correction of -0.01 ft was also made on August 18, and its distribution overlaps. Missing DCP data from November 23, 2008 was filled in using chart backup with no loss of accuracy. Three shaft encoder corrections of + .01 ft, -.01 ft and -.01 ft were applied to the record this year. Each was run as a correction back to the previous matching reading.

Datum Corrections.-- Levels were last run on 8/16/2006. No correction was necessary to RP or tape. (However, R.M. No. 1 was measured as having an elevation of 4.97 ft. rather than the 5.00 ft. used for many years.)

Rating.-- The control is a six-foot sharp-crested Cipolletti weir with rectangular weir sections for flow above 1.0 foot. The weir pool freezes in the winter, but the weir continues to operate apparently well. Rating No. 7, in use since October 1, 1973 was continued this year. It has been confirmed by measurements to 419 cfs. The cableway was removed for safety reasons and high flow measurements are no longer possible at the gage. No possibilities exist for bridge measurements. Maximum wade is approximately 200 cfs (due to rocky channel and unevenly distributed flow through the channel). Six measurements (44 - 49) were made this water year. Discharge measurements range in discharge between 10.7 cfs to 187 cfs. The rating is well defined for the entire range experienced except for flows above 250 cfs. The peak flow of 535 cfs occurred at 2000 on June 26, 2009 at a gage height of 3.42 ft with a shift of 0.00 ft.

Discharge.-- Shifting control method was used. Measurements show unadjusted shifts varying between -0.08 and 0.01 feet. Measurements were given full weight and applied except for measurement Nos. 44, 46 – 49 which were adjusted up to 4% to better fit the variable stage-shift relationship BOCMIDCOVST01. Shifts were distributed as follows: a -0.02 ft shift was carried over from WY2008 and ran continuously through the winter months during the period 10/1/2008 to 4/28/2009. From 4/28/2009 to 09/30/2009 shifts were applied using table BOCMIDCOVST01, which is based on all measurements for the year.

Special Computations.-- On the coldest ice –affected days, the GH 'painted' or cycled rapidly up and down. The inlets plugged, then the well drained and then the head difference would force the inlets open again (until they froze again...) The true (ice affected !!) GH was the top of the trace. The ice days were determined by chart inspection and by identifying days when the maximum temperature dropped below freezing and the computed flow increased. Many other winter days had a small rise around noon. This rise might have been diurnal flow or it might have been ice melting, breaking off, and jamming on the weir. Without more information it was not possible to tell if the record was ice affected on these "bump" days. Discharge for ice affected days with false peaks was computed on the basis of partial day records, by cutting off some ice peaks on graphic chart, and inserting estimated values into the daily database. Some days did not have an obvious ice affect, but showed increasing discharge when the temperatures were dropping well below freezing. For these days discharges were directly estimated to fit with adjacent record.

Remarks.-- The record is good, except for periods of ice effect which are estimated and considered poor. These days are considered fair: May 14-22 and 26-29, 2009 due to a large stage correction and lack of definition for stage-shift relationships; June 1-7, 18-29, 2009 due to lack of definition for stage shifts; July 30-August 18, 2009 due to a large stage correction. The instantaneous peak flow is also fair due to lack of stage-shift definition. Flows above 250 cfs (GH = 2.34 ft.) are considered fair this year due to lack of definition of the stage shift relationships above this gage height. This includes the following days: May 18-22, 26- 29, June 1-7, 18-29, 2009.

Recommendations.-- Visits by Boulder personnel to keep the weir clear of ice in the winter should be confirmed. Station should be visited more often to check the control. The outside staff gage should be replaced because it was torn down with debris coming through the station. Acoustic Doppler Current Profiler (ADCP) measurement was attempted here for the first time this year with minimal success. More ADCP measurements should be performed to identify the accuracy of the measurement. If possible, winter measurements should be attempted to help determine winter flows.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06725500 MIDDLE BOULDER CREEK AT NEDERLAND

RATING TABLE--

BOCMIDCO07 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

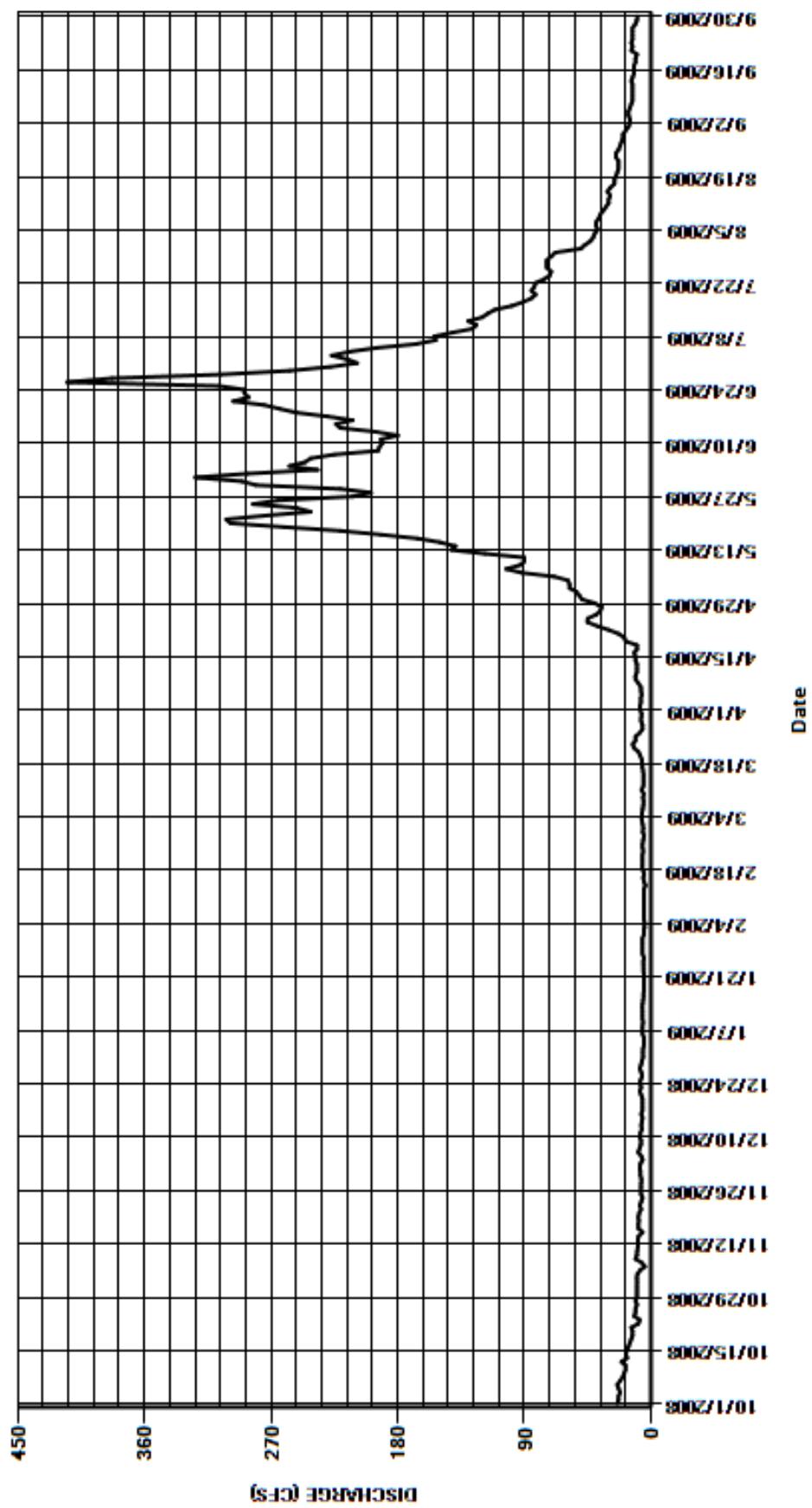
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	9.9	7.6	5.8	5.2	5.5	7.6	51	324	209	47	16
2	23	9.8	7.9	5.7	5.1	5.9	7.8	53	287	216	43	15
3	23	10	7.5	5.1	4.7	6.5	7.2	58	237	227	41	15
4	22	9.7	5.9	5	4.6	6.7	7.3	58	257	214	40	16
5	23	7.8	7	5	4.9	6.4	6.7	59	246	195	38	16
6	24	4.3	9.1	6	5.1	5.9	7.1	69	242	167	39	15
7	22	6.6	8.1	6	4.9	5.5	7.2	92	225	153	39	14
8	20	11	7.2	6	5.1	5.2	8.9	103	194	154	37	13
9	19	10	7	5.7	5	5.7	11	93	193	141	36	13
10	18	9.8	8	6	5	5.1	11	90	191	127	34	13
11	18	9.5	7.5	6	5	6.7	10	90	192	124	32	13
12	21	9.3	6.5	6	5	5.5	10	118	180	130	30	13
13	17	9.4	7	6.3	5	5.3	10	142	196	120	30	14
14	18	8.7	6.5	5.9	4	5.3	11	139	221	116	29	13
15	17	6	6	5.6	5	5.3	11	150	224	111	31	12
16	16	9	7	5.2	5.5	5.7	12	166	212	99	29	12
17	15	8.9	6	5.2	4.8	6.1	9.8	192	230	91	26	12
18	14	8.7	6	4.9	5.7	6.5	10	221	252	85	26	11
19	13	8.9	6	5	6.2	6.6	18	261	264	82	25	11
20	13	8.4	6	5	6	7.6	19	299	275	85	24	10
21	14	7	7	5	6	8.9	23	302	297	83	23	14
22	9	8	8	5.2	6	12	30	274	286	82	23	13
23	8	7	6.9	5.2	5.5	13	38	242	289	76	23	14
24	12	6	8	5.4	6	11	45	252	289	72	25	13
25	11	7.1	7.3	5.5	5.9	11	45	283	307	71	25	13
26	11	7.2	6.2	5	5.5	8	39	265	415	74	23	13
27	10	7.1	7	6	4.9	6	36	212	383	74	22	13
28	11	7	8	6	5.9	6	35	199	306	74	21	11
29	10	6.9	7	6	---	7	40	221	257	71	20	10
30	10	7.6	6.4	6	---	7	49	281	228	68	20	9.6
31	9.9	---	5.6	6.1	---	6.7	---	291	---	50	18	---
TOTAL	495.9	246.6	217.2	172.8	147.5	215.6	582.6	5326	7699	3641	919	390.6
MEAN	16	8.22	7.01	5.57	5.27	6.95	19.4	172	257	117	29.6	13
AC-FT	984	489	431	343	293	428	1160	10560	15270	7220	1820	775
MAX	24	11	9.1	6.3	6.2	13	49	302	415	227	47	16
MIN	8	4.3	5.6	4.9	4	5.1	6.7	51	180	50	18	9.6
CAL YR	2008	TOTAL	19217.0	MEAN	52.5	MAX	324	MIN	4.3	AC-FT	38120	
WTR YR	2009	TOTAL	20053.8	MEAN	54.9	MAX	415	MIN	4	AC-FT	39780	

MAX DISCH: 535 CFS AT 20:00 ON Jun. 26,2009 GH 3.42 FT. SHIFT 0 FT.

MAX GH: 3.42 FT. AT 20:00 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06725500 MIDDLE BOULDER CREEK AT NEDERLAND
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06727000 BOULDER CREEK NEAR ORODELL
Water Year 2009

Location.--	Lat. 40°00'23", Long. 105°19'49", in NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, T.I N., R.71 W., Boulder County, Hydrologic Unit 10190005, on left bank along State Highway 119, 0.7 mi southwest of old Orodell, 1.1 mi upstream from Fourmile Creek, and 2.9 mi southwest of courthouse in Boulder.
Drainage and Period of Record.--	102 mi ² . 1906 to present.
Equipment.--	Graphic water-stage recorder and Sutron 8210 DCP high data rate with shaft encoder in a 6 foot by 6 foot concrete shelter with a 54-inch corrugated metal well. The primary reference is a tape down from RP. There is an outside staff gage across the stream that reads approximately 1 foot lower than gage datum. The gage has AC power to keep the well open. The station also has a pressure transducer and telemetry installed by Urban Drainage and Flood Control District.
Hydrographic Conditions.--	Flows are regulated by storage in Barker Reservoir, and by diversion from Barker for power generation. Hydropower water is returned a few hundred feet above the gage and displays a step and peak hydrograph. A constant release is maintained from Barker throughout the year. In past years power was generated in the winter keeping the gage open. With the purchase of the Barker system by the City of Boulder, power is no longer generated through the entire winter (although they plan on running it as much as possible through the winter from now on).
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable, except as follows: November 24–27, 2008, March 27-28, 2009, when the gage was ice affected; December 1, 2008 to March 20, 2009, when the station was closed for winter; April 17, 2009, when the DCP missed 4 hourly values. Checks between the primary and backup records agreed within +/- 0.02 feet. Instrument calibration is supported by 18 visits made to the gage this year. There were no corrections related to flushing, debris, or instrument error.
Datum Corrections.--	Levels were last run on August 16, 2006. They were within allowable tolerances and no adjustment was necessary.
Rating.--	The control is a cobble and boulder riffle 60 feet below the gage. The channel is the control for higher stages. This station is subject to shifting caused by cobble and boulders moving in and out of still pool and over control. Rating No. 14, in use since WY 2005, was continued this year. Rating 14 is defined to 715 cfs by measurements. Eighteen measurements (473 - 490) were made this year. They ranged in discharge from 14.8 to 715 cfs. Measurements cover the range in mean daily flows experienced except for low flows experienced on December 5 and 15, 2008 and February 28, 2009. The peak flow of 932 cfs occurred at 0200 on June 27, 2009 at a gage height of 3.54 ft with a shift of 0.05 ft. It exceeded measurement no. 485, made June 27, 2009 by 0.16 feet in stage.
Discharge.--	Shifting control method was used all year. Moss and debris accumulation is not an issue at this gage; however fill and scour conditions as well as control movement does occur. Additionally, boulders comprising the control are subject to becoming lodged or dislodged during runoff events. Shifts were applied by time and by stage. Shifts were distributed by time proration for the period Oct 1, 2008 to Apr. 28, 2009, and from Aug 11 to the end of the water year. Shifts were distributed by stage for the period Apr 28-Aug 11, 2009 using a variable stage shift relationship based on Msmt. Nos. 480 - 488, made during period of use. Measurements show unadjusted shifts varying between -0.07 and 0.05 feet. All measurements were given full weight except Nos. 473, 484, 486, and 488, which were adjusted up to 5% to better fit the distributions.
Special Computations.--	A spreadsheet was used to compute winter record using a mass balance with the downstream gage (Boulder Creek at Boulder) and diversions. Discharges for the winter period (November 24-27, 2008, December 1, 2008 – March 20, 2009, and March 27 and 28, 2009) were estimated by examining discharges from the gage at Boulder Creek at Boulder (BOCOBOCO) plus diversions between BOCOBODO and BOCOROCO. These VALUES were also compared to the four measurements made at both gages.
Remarks.--	Record is good, except for the periods of ice effect and no gage height record, which are estimated and poor due to ice. Station maintained and record developed by Patrick Tyler.
Recommendations.--	High flow Measurement 481 (715 cfs) showed a significant deviation from the current rating and should be verified with future high flow measurements.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06727000 BOULDER CREEK NEAR ORODELL

RATING TABLE--

BOCOROCO14 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

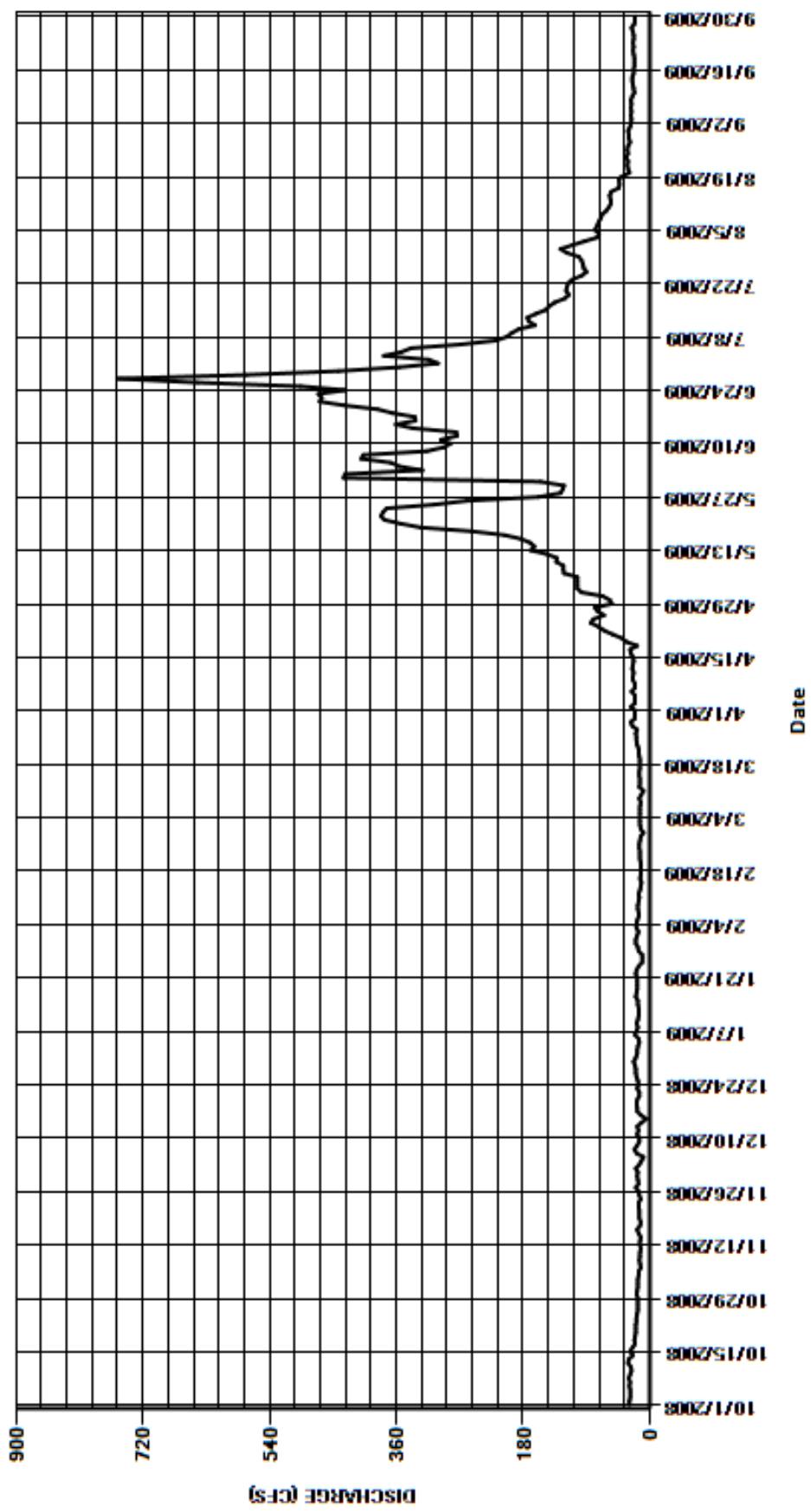
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	17	17	18	18	13	21	67	435	301	110	28
2	29	17	20	18	16	14	27	97	433	314	93	27
3	28	17	15	17	19	14	21	103	323	378	75	26
4	28	16	12	15	19	14	21	103	356	353	72	27
5	28	16	9	16	18	14	21	103	368	339	78	26
6	29	13	19	21	16	14	26	103	410	268	75	27
7	28	14	22	19	16	14	21	122	407	218	73	26
8	30	15	18	17	17	13	21	123	317	203	70	27
9	28	14	15	19	17	15	24	123	293	196	68	25
10	26	14	15	17	16	12	24	133	283	186	62	22
11	27	13	18	16	15	9	23	132	297	163	58	23
12	31	14	16	16	16	15	25	146	274	172	55	24
13	30	14	18	16	14	14	24	169	275	174	56	25
14	24	13	12	17	13	14	23	164	336	162	57	25
15	28	16	5	17	12	15	24	170	361	148	55	23
16	25	18	13	20	14	15	27	183	333	143	44	23
17	21	14	18	19	13	14	28	206	334	135	43	22
18	22	13	18	18	13	14	18	253	366	121	44	22
19	21	15	19	18	13	14	33	325	387	115	40	22
20	20	15	18	18	13	15	40	354	434	119	29	23
21	20	15	15	18	14	16	53	377	469	118	31	24
22	20	16	15	20	14	16	65	382	466	116	32	23
23	19	16	18	19	14	18	73	379	471	110	31	24
24	19	13	16	16	15	19	84	374	432	97	34	23
25	18	15	17	11	15	19	80	306	496	90	31	23
26	17	16	19	11	14	20	65	260	643	94	32	24
27	17	20	20	11	13	18	74	158	755	95	31	26
28	17	16	20	16	9	25	78	127	573	97	28	22
29	17	17	21	17	---	27	54	124	442	101	30	21
30	19	18	23	20	---	21	57	122	356	118	30	21
31	18	---	20	20	---	21	---	155	---	127	31	---
TOTAL	733	460	521.0	531	416.0	496.0	1175	5943	12125	5371	1598	724
MEAN	23.6	15.3	16.8	17.1	14.9	16	39.2	192	404	173	51.5	24.1
AC-FT	1450	912	1030	1050	825	984	2330	11790	24050	10650	3170	1440
MAX	31	20	23	21	19	27	84	382	755	378	110	28
MIN	17	13	5	11	9	9	18	67	274	90	28	21
CAL YR	2008	TOTAL	23211.0	MEAN	63.4	MAX	351	MIN	5	AC-FT	46040	
WTR YR	2009	TOTAL	30093.0	MEAN	82.4	MAX	755	MIN	5	AC-FT	59690	

MAX DISCH: 932 CFS AT 02:00 ON Jun. 27,2009 GH 3.54 FT. SHIFT 0.05 FT.

MAX GH: 3.54 FT. AT 02:00 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06727000 BOULDER CREEK NEAR ORODELL
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
BOULDER CREEK AT BOULDER, CO
Water Year 2009

Location.--	Lat 40° 00' 53", long 105° 16' 49", in SW SW Sec. 30, T.1N., R.70W., Boulder County, on right bank in Central Park, 1 block West of the Broadway St. Bridge over Boulder Creek. Gage is located where the center line from 11th St crosses Boulder Creek.
Drainage and Period of Record.--	N/A. May 2004 to present.
Equipment.--	Sutron 8210 DCP with a Sutron Constant Flow Bubbler (CFB) in a 3 ft x 2.5 ft x 1 ft NEMA shelter. The primary reference is a staff gage placed on the right side of the channel slightly downstream from the shelter. There is no backup recording device.
Hydrographic Conditions.--	Flows are regulated by storage in Barker Reservoir, and by diversions below Barker Reservoir. Other flows include North Boulder Creek, which converges with Middle Boulder Creek above Boulder Creek at Orodell, (BOCOROCO). The channel generally will stay open and free of ice during the winter months. However, during periods of sustained cold ice may build up on the boulder control approximately thirty feet down stream of the gage station. This year temperatures remained relatively warm and ice was not much of a factor.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data. There is no backup data at this gage. Record is complete and reliable, except for the following periods: January 13, 24-28, March 10-15 2009, when the stage-discharge relationship was ice affected. The DCP missed one hourly value on November 23, 2008. The value was filled in using adjacent data with no loss in accuracy. The bubbler operated very well throughout the year. The visits show reasonable agreement with the bubbler value and the primary reference with only two instrument corrections on May 13 and August 11, 2009.
Datum Corrections.--	Levels were not run this water year.
Rating.--	Section control is a manmade boulder weir approximately 50 feet downstream,. Another boulder control approximately 30 ft further downstream could come into play at very high flows. Cobble and boulder riffles occupy the intermediate stretch between the two controls. The channel banks are part of the control at higher stages. Rating No. 03, developed May 24, 2005 was used again this year. Rating 3 is defined by measurements to 771 cfs, based on a 2005 high measurement of 514 cfs. Twenty-one measurements (Numbers 100-120) were made this year. They range in discharge from 8.46 to 499 cfs. They cover the range of mean daily flows experienced throughout the water year. The peak flow of 678 cfs occurred at 0330 on June 27, 2009 at a gage height of 3.81 ft with a shift of 0.06 ft. It exceeded measurement Number 115, made June 26, 2009 by 0.41 feet in stage.
Discharge.--	Shifts are caused by scour and fill of the gage pool. Shifts were applied as defined by measurements and distributed by time from October 1, 2008 through September 30, 2009. Unadjusted measurements show shifts varying between -0.07 and 0.06 feet. All measurements were given full weight and applied, except measurement numbers 109, 110, 111, 112 which were adjusted to 0.00 ft, and No. 121 which was adjusted 5%, to smooth shift distribution. Measurement No. 114 was not used in the shift distribution; the meter and weight swung widely side to side during the cable measurement.
Special Computations.--	Ice days in January were estimated from adjacent record and in some cases rounded to the nearest 5 cfs. Computed record was used for suspected ice period in March.
Remarks.--	Record is good, except as follows: January 13, 24-28, 2009, affected by ice in channel or on control, estimated and rated as poor; March 10-15, 2009, suspected ice affect, not estimated but downgraded to fair. Station maintained and record developed by Patrick Tyler.
Recommendations.--	A new rating should be developed using recent high water measurements. An air temperature sensor should be installed to assist with winter record.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BOULDER CREEK AT BOULDER, CO

RATING TABLE--

BOCOBOCO03 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

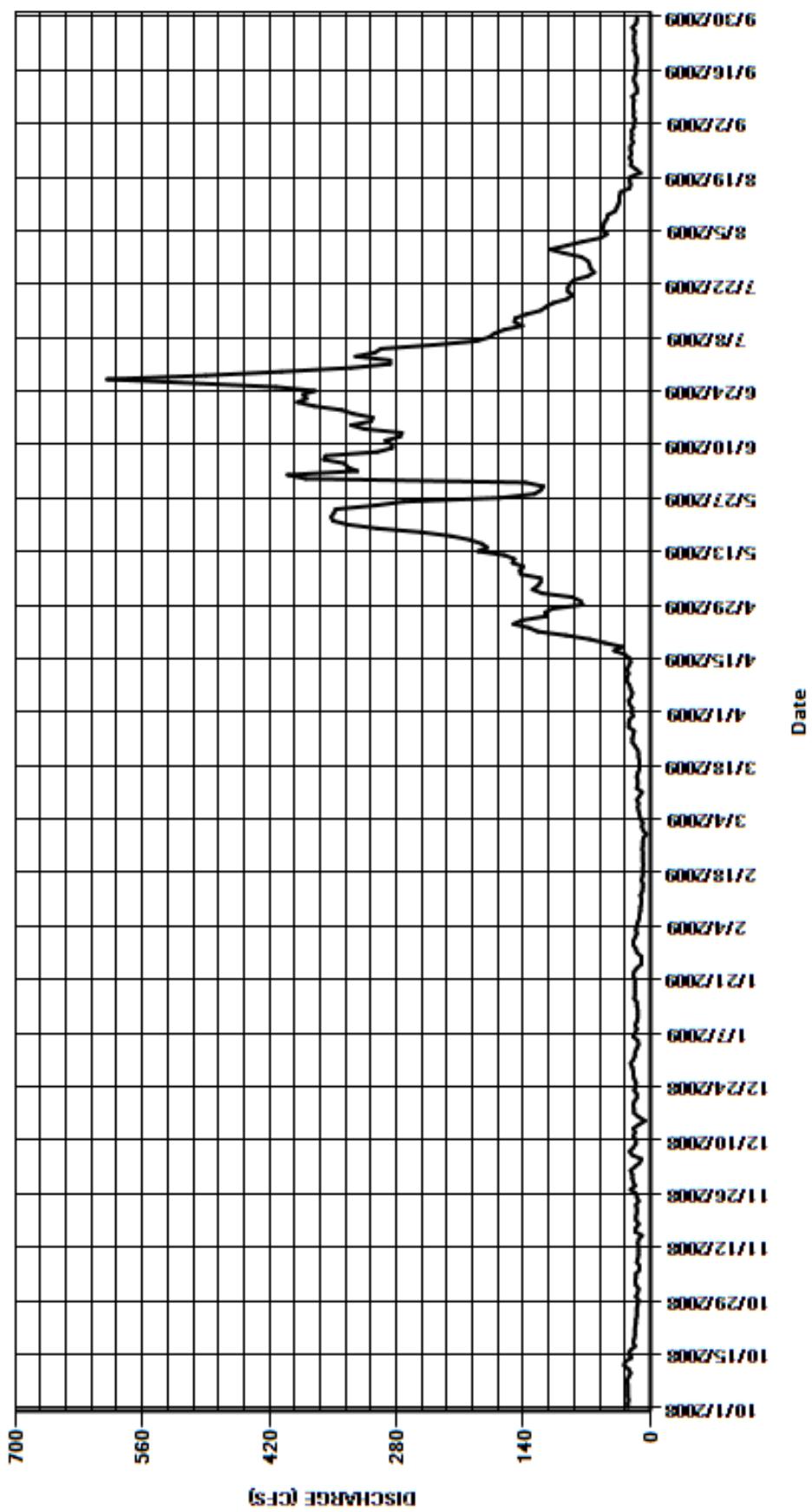
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	13	20	17	17	8.1	21	86	380	287	92	18
2	25	16	22	17	15	9.5	20	119	400	287	75	18
3	24	17	17	15	16	8.5	23	130	323	325	55	17
4	25	16	12	13	15	11	24	124	334	304	48	19
5	25	16	9.7	14	14	12	21	121	337	297	53	18
6	25	12	20	19	12	13	20	121	360	239	52	19
7	25	12	23	17	12	14	22	143	358	192	51	19
8	26	15	19	15	11	13	23	144	301	178	48	18
9	24	14	16	17	11	15	26	140	285	172	47	20
10	22	13	16	15	10	12	26	152	285	161	39	15
11	24	13	19	14	9.9	9.2	24	150	292	141	37	15
12	29	13	17	14	11	15	26	161	276	150	35	16
13	28	14	19	14	9	14	24	190	274	149	34	18
14	21	13	13	15	8.5	14	22	180	315	137	34	18
15	24	9.2	5.8	15	8.4	15	23	186	330	121	33	16
16	22	17	13	18	10	14	28	199	308	115	23	16
17	17	16	18	17	8.7	12	40	220	306	107	22	16
18	19	13	18	17	8.3	12	31	253	328	92	23	15
19	18	16	19	17	8.7	12	50	301	341	86	22	15
20	17	16	18	17	7.8	13	67	334	371	91	11	16
21	17	15	15	17	8.5	13	93	350	389	91	16	18
22	17	15	15	19	8.6	14	124	352	379	89	22	17
23	16	16	18	18	8.2	17	134	349	383	84	21	18
24	16	13	16	15	9	20	151	347	370	69	23	18
25	15	15	16	10	8.5	20	141	303	413	62	21	18
26	15	16	18	10	8.4	19	115	272	503	66	22	17
27	15	22	19	10	7.9	18	116	165	599	67	22	20
28	14	17	19	15	4.5	24	108	128	490	69	19	16
29	13	19	20	16	---	24	75	121	407	76	21	15
30	16	20	22	19	---	23	77	118	330	95	20	15
31	14	---	19	19	---	19	---	138	---	111	21	---
TOTAL	633	452.2	531.5	485	286.9	457.3	1695	6097	10767	4510	1062	514
MEAN	20.4	15.1	17.1	15.6	10.2	14.8	56.5	197	359	145	34.3	17.1
AC-FT	1260	897	1050	962	569	907	3360	12090	21360	8950	2110	1020
MAX	29	22	23	19	17	24	151	352	599	325	92	20
MIN	13	9.2	5.8	10	4.5	8.1	20	86	274	62	11	15
CAL YR	2008	TOTAL	21133.5	MEAN	57.7	MAX	296	MIN	5.8	AC-FT	41920	
WTR YR	2009	TOTAL	27490.9	MEAN	75.3	MAX	599	MIN	4.5	AC-FT	54530	

MAX DISCH: 678 CFS AT 03:30 ON Jun. 27,2009 GH 3.81 FT. SHIFT 0.06 FT.

MAX GH: 3.81 FT. AT 03:30 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOULDER CREEK AT BOULDER, CO
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
Water Year 2009

Location.--	Lat 39°56'18", long 105°20'53", NW1/4 sec. 28, T.1 S., R.71 W., Boulder County. Measures releases from Gross Reservoir; which is filled by South Boulder Creek and transmountain diversions from Moffat Tunnel.
Drainage and Period of Record.--	92.8 sq. mi. East Slope drainage (Moffat Tunnel West Slope drainage not included). Oct. 1967 to present.
Equipment.--	Graphic water stage recorder, a Sutron Satlink Data Collection Platform (DCP) with shaft encoder transmitting hourly in concrete shelter and concrete well, positioned on the right side of a 25 ft. Parshall Flume. The primary reference is an electric tape gage in the gage house with a supplemental staff gage located in the flume. A foot bridge crosses the flume just above the staff location and is used for high flow measurements. Urban Drainage Flood Control District has installed a transducer in well to monitor high flows. The structure is owned and maintained by the Denver Water Department.
Hydrographic Conditions.--	Gross Reservoir is an on-stream reservoir; therefore, controlled release from Gross Reservoir as regulated by the Denver Water Department, and only partial control only when the reservoir's spillway is in use. Water retained and released by Gross Reservoir includes transmountain water conveyed from the Fraser River Basin via the Moffat Tunnel Near Rollinsville, CO (MOFTUNCO) structure as well as waters native to South Boulder Creek. Water released from Gross Reservoir into South Boulder Creek can be diverted to Denver Treatment facilities about 3 miles downstream at the South Boulder Creek Diversion (BOSDELCO) structure.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with chart record and DCP log data as back up. The record is complete and reliable, except as follows: December 27, 2008 and January 26-28, 2009, when ice on the control affected the stage-discharge relationship. Checks between the primary and backup records agreed within +/- 0.02 feet. Instrument calibration is supported by 16 visits made to the gage this year. However, three instrumentation corrections were noted throughout the year ranging in magnitude from +0.01 to -0.01 feet. All corrections were considered and applied to the record as defined by time.
Datum Corrections.--	Levels were last run on September 4, 2007. No correction was indicated nor applied.
Rating.--	<p>The control is a 25-foot Parshall Flume located in the channel about 1000 yards below the dam outlets. The condition of the structure is generally good, although the floor has some roughness that causes some velocity variations and helps moss / algal growth to get established. The flume does not have much of an upstream stilling pool, which can further affect the flume's performance by buildup of gravel in the approach. The flume is also susceptible to higher than expected approach velocities at higher release rates. Shifts at lower flows are due to moss buildup on the floor as well as the gradual 'aging' roughness of the floor bottom which causes variations in velocities. Shifts can be caused by approach conditions at higher stages as well. For much of this water year a sand bar has been developing just upstream of the flume on the left side of the channel and is contributing to uneven approach velocities. A standard 25-foot Parshall Flume rating was used all year. Using the USBR Water Measurement Manual, Figure 8-9, Page 8-44, a the range of accurate discharge measurement of a 25 ft Parshall Flume is 15 cfs (Gage Height = 0.32 ft) to 1660 cfs (Gage Height = 6.00 ft).. Flows above or below this range are outside the +/- 5% accuracy range, unless these flows are further defined by measurements.</p> <p>Fifteen measurements (659-673) were made this year. They range in discharge from 6.59 to 356 cubic feet per second (cfs). The measurements cover the range in stage experienced throughout the year. The peak flow of 429 cfs occurred at 0945 on May 19, 2009 at a gage height of 2.57 ft with a zero shift. It exceeded measurement No. 669, made May 19, 2009 by 0.30 ft of stage.</p>
Discharge.--	Shifting control method was used all year. Shifts were applied as defined by measurements and were distributed by time with consideration of stage changes for the entire water year. Open water measurements showed shifts varying between -0.03 ft and +0.03 ft. Shifts at this structure, historically, fall within 5% of the STD25FTP Rating, therefore, operationally; the shifts are adjusted to zero at the time of the measurement. Any shifts that cannot be adjusted to zero within the 5% tolerance threshold are given full weight or adjusted to better fit the measurement profile. Measurement Nos. 659, 665, 666, 667, 669, 670, and 671 were all adjusted from 1% to 5% to a zero shift. Measurement Nos. 660 and 664 were adjusted up to 5% to better fall in line with relevant shifts. Measurement Nos. 661, 662, 663, 668, 672, and 673 were all given full weight.
Special Computations.--	Stage-discharge relationship was affected by ice on December 27, 2008 and January 26-28, 2009. Discharge values were estimated from adjacent periods of good record with consideration to temperature trends and Denver Water Accounting sheets for the affected periods. A comparison of the record using zero shifts against giving full weight to all measurements was made.
Remarks.--	The record is rated good except periods when the average daily flow fell below 15 cfs and which were not defined by measurements and are considered fair: February 12-13, 22-27, 2009, March 17-20, 2009. The ice affected periods of December 27, 2008 and January 26-28, 2009 are estimated and fair. This record will be directly used to estimate winter flows at the South Boulder Creek At Eldorado Springs (BOCESLCO) gage. Station maintained and record developed by Patrick Tyler.
Recommendations.--	The flume is susceptible to moss growth throughout the year. Frequent cleaning is needed to insure no affect to gage height. Better documentation of Denver Water staff's daily visits to the gage is requested. Also, the operator should be consulted to find out if release was completely constant during any ice periods. If so, any ice record can be estimated without loss of accuracy using prior and subsequent discharges. The gravel bar developing upstream of the flume should be watched for further impact on the flume's performance. Cleaning and deepening of the stilling pool upstream of the flume is highly recommended.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR

RATING TABLE--

STD25FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

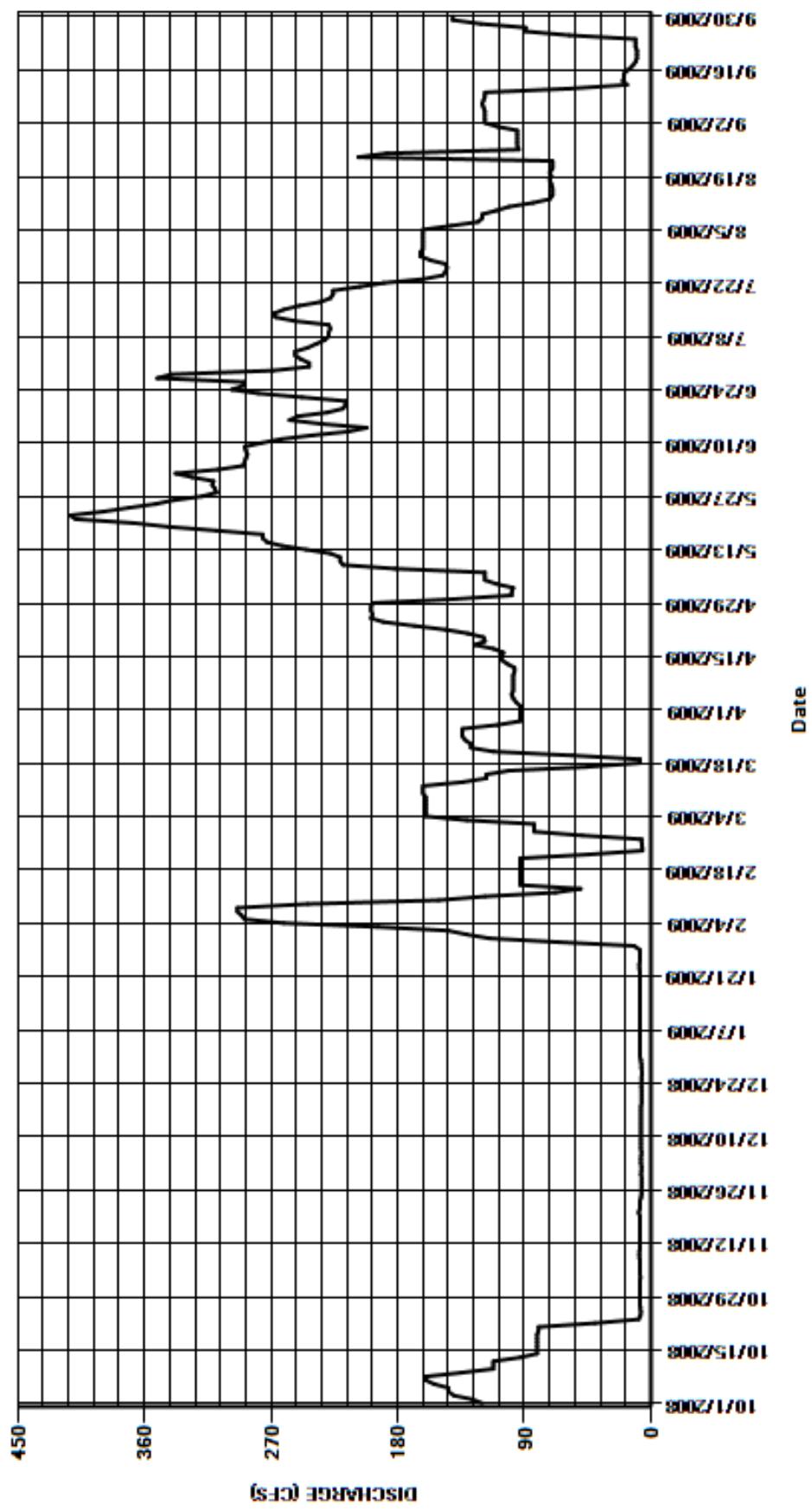
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	120	7.8	6.9	7.8	131	83	93	99	326	243	162	109
2	127	7.8	6.7	7.8	144	83	93	99	338	249	162	118
3	140	7.6	7.2	7.8	194	131	96	98	308	253	162	118
4	144	7.8	7.2	7.8	261	160	98	110	290	253	162	118
5	144	7.8	7	7.8	289	160	99	118	289	244	162	118
6	154	7.8	6.9	7.8	291	160	98	118	288	238	142	119
7	160	7.8	7.2	7.8	294	160	98	118	287	232	123	120
8	160	8.1	7.2	7.8	294	160	98	182	288	229	120	119
9	135	8.4	7.2	7.8	244	160	98	219	289	229	120	118
10	112	8.1	7.2	7.8	151	162	98	221	277	228	110	118
11	112	7.8	7.2	7.8	118	162	97	221	263	229	101	58
12	112	7.8	7.2	7.8	68	162	97	228	241	253	84	17
13	93	7.8	7.2	7.8	50	134	102	245	215	267	72	20
14	81	7.8	7.2	7.8	93	117	106	262	202	268	70	19
15	81	7.8	7.2	7.8	93	117	106	273	234	261	70	19
16	81	7.8	7.2	7.8	93	101	105	276	257	250	70	16
17	81	7.8	7.2	7.8	93	45	112	276	251	235	71	13
18	81	7.8	7.1	7.8	93	7.7	125	309	230	228	72	11
19	81	7.7	6.6	7.8	93	7.8	118	343	219	226	71	10
20	80	8.8	6.6	7.8	93	56	119	368	217	226	72	10
21	80	8	6.6	7.8	93	112	130	409	217	207	70	10
22	40	7.8	6.6	7.8	44	128	146	413	248	190	70	11
23	8.8	7.8	6.9	8.2	6.1	128	168	389	279	162	70	11
24	7.5	7.1	6.6	8.4	6.3	132	190	371	298	148	208	11
25	7.2	6.7	6.6	7.9	6.6	134	199	352	290	146	188	58
26	7.6	6.7	6.6	8	6.6	134	198	339	289	145	94	89
27	7.8	6.6	6.5	8	49	134	199	319	351	146	95	89
28	7.8	6.6	6.8	8	83	109	199	309	341	157	95	121
29	7.8	6.6	6.9	12	---	93	198	310	269	164	95	141
30	7.8	7.1	7.2	66	---	93	141	312	243	164	95	141
31	7.8	---	7.8	115	---	93	---	311	---	162	95	---
TOTAL	2469.1	228.9	216.5	413.1	3474.6	3618.5	3824	8017	8134	6632	3353	2050
MEAN	79.6	7.63	6.98	13.3	124	117	127	259	271	214	108	68.3
AC-FT	4900	454	429	819	6890	7180	7580	15900	16130	13150	6650	4070
MAX	160	8.8	7.8	115	294	162	199	413	351	268	208	141
MIN	7.2	6.6	6.5	7.8	6.1	7.7	93	98	202	145	70	10
CAL YR	2008	TOTAL	52778.7	MEAN	144	MAX	578	MIN	6.1	AC-FT	104700	
WTR YR	2009	TOTAL	42430.7	MEAN	116	MAX	413	MIN	6.1	AC-FT	84160	

MAX DISCH: 429 CFS AT 09:45 ON May. 21,2009 GH 2.57 FT. SHIFT 0 FT.

MAX GH: 2.57 FT. AT 09:45 ON May. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS
Water Year 2009

Location.-- Lat 39°55'58", long 105°18'29", SW $\frac{1}{4}$ sec. 26, T.1 S., R.71 W., Boulder County. Diverts Denver Water Dept. rights released from Gross Reservoir to South Boulder Creek.

Drainage and Period of Record.-- N/A. Oct. 1958 to present.

Equipment.-- Data Collection Platform (DCP), shaft encoder and a weekly chart recorder in a timber shelter and concrete well at 12 ft Parshall Flume. The primary reference is an electric tape gage with a supplemental outside staff. Gage is owned and maintained by Denver Water Dept.

Hydrographic Conditions.-- Controlled diversion of water released from Gross Reservoir, about 3 miles upstream, to Ralston Reservoir for municipal use. The diversion is the delivery point for west slope water diverted through Moffat Tunnel. Municipal diversions of 5-10 cfs are made downstream. Accurate measurement at this gage is important to insure that the proper amount of water passes to the downstream users.

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Satellite data agreed with the recorder data within +/-0.02 foot. The record is reliable and complete. Two hourly values were missed on Oct. 1, 2008. The values were filled in using the chart back-up with no loss of accuracy. The diversion was off or only producing trickle flows on the following days: Oct. 23, 2008 – Jan. 30, 2009, Feb. 12-13, 22-27, Mar. 17-20, Apr. 20-May 8, Sept. 11-25, 2009. Trickle flow (gage heights less than 0.1 ft.) has been zeroed out as was in past Water Years.

Datum Corrections.-- Levels were last run November 14, 2006. No correction was necessary.

Rating.-- Control is a 12 foot Parshall Flume. Positive or negative shifts can be caused by approach conditions, particularly at high flows. A large timber is hung in the canal upstream to damp the flow from the headgate. Moss can become a factor if the diversion runs for a long period. A standard 12 foot Parshall Flume rating was used all year with zero shift. It is defined for all ranges of flow experienced. Historically, the shifts and adjustments we have seen at higher flows (300 cfs range) seem to justify a non-standard rating. Six measurements (No's. 361-366) were made this water year, ranging in discharge between 51.6 and 116 cfs. The peak flow of 322 cfs occurred at 0730 on August 25, 2009 at a gage height of 3.34 feet with a shift of 0.00 ft. It exceeded measurement No. 365 (made on July 21, 2009), by 1.61 ft. in stage.

Discharge.-- Shifting control method was used. Zero shifts are used per agreement with Denver Water Department. Unadjusted shifts ranged from -0.04 to 0.03 ft. Each non-zero shift was adjusted to zero. A zero shift was applied for the entire year. All measurement's made this year (Nos. 361 – 366) were adjusted up to 5% to a zero shift.

Special Computations.-- Zero flow periods are verified against Denver Water Department Operations spreadsheets. Comparison of daily flows must take into account Denver's daily flows are computed from noon on the accounting day to noon the next day.

Remarks.-- The record is good. Trickle flows under the diversion gate were zeroed out per agreement with Denver Water Department. Station maintained and record developed by Patrick Tyler.

Recommendations.-- Included in the record is a mass balance between BOCBGRCO, BOCELSCO, & BOSDELCO. There have been some inconsistencies (in past measurements) in the way depths and widths are being taken. Using a single average depth for a measurement does not yield results that are defensibly more accurate than the basic flume table. Individual depths need to be taken in each section rather than averaging depths for the entire cross section. Potential inaccuracies are seen on the DMS in the differences recorded in areas for comparable GH measurements. When moss is observed and a negative shift is measured which supports a moss effect, the water commissioner should be notified. Depending on his input, Denver may be requested to clean the flume.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS

RATING TABLE--

STD12FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	103	0	0	0	121	74	76	0	87	61	92	90
2	109	0	0	0	134	74	76	0	100	65	91	101
3	121	0	0	0	181	117	78	0	100	65	91	101
4	126	0	0	0	248	151	80	0	100	65	91	102
5	126	0	0	0	280	150	80	0	100	66	97	104
6	136	0	0	0	280	147	80	0	100	79	84	105
7	143	0	0	0	280	146	80	0	100	89	70	105
8	145	0	0	0	281	146	80	43	100	94	70	105
9	120	0	0	0	236	148	80	76	100	107	70	102
10	100	0	0	0	147	149	80	76	94	108	65	101
11	100	0	0	0	111	150	80	76	84	112	60	48
12	100	0	0	0	68	151	80	75	69	136	54	0
13	84	0	0	0	33	126	81	74	45	152	50	0
14	70	0	0	0	86	107	81	75	31	152	51	0
15	71	0	0	0	86	107	81	74	42	152	53	0
16	71	0	0	0	86	93	81	74	50	145	52	0
17	71	0	0	0	85	43	80	74	56	141	52	0
18	71	0	0	0	86	0	80	74	60	142	52	0
19	71	0	0	0	86	0	80	74	60	143	52	0
20	69	0	0	0	86	37	79	75	72	143	54	0
21	68	0	0	0	86	97	79	75	81	125	55	0
22	35	0	0	0	42	115	79	75	108	112	55	0
23	0	0	0	0	0	114	79	75	130	92	55	0
24	0	0	0	0	0	116	79	76	134	80	175	0
25	0	0	0	0	0	117	79	76	128	82	180	37
26	0	0	0	0	0	117	79	76	128	82	76	76
27	0	0	0	0	34	117	79	76	129	83	75	76
28	0	0	0	0	74	93	79	75	88	93	77	104
29	0	0	0	0	---	76	79	75	51	102	78	126
30	0	0	0	46	---	76	37	75	53	102	78	125
31	0	---	0	102	---	76	---	75	---	96	78	---
TOTAL	2110.00	0.00	0.00	148.00	3237.00	3230.00	2341	1769.00	2580	3266	2333	1608.00
MEAN	68.1	0	0	4.77	116	104	78	57.1	86	105	75.3	53.6
AC-FT	4190	0	0	294	6420	6410	4640	3510	5120	6480	4630	3190
MAX	145	0	0	102	281	151	81	76	134	152	180	126
MIN	0	0	0	0	0	0	37	0	31	61	50	0

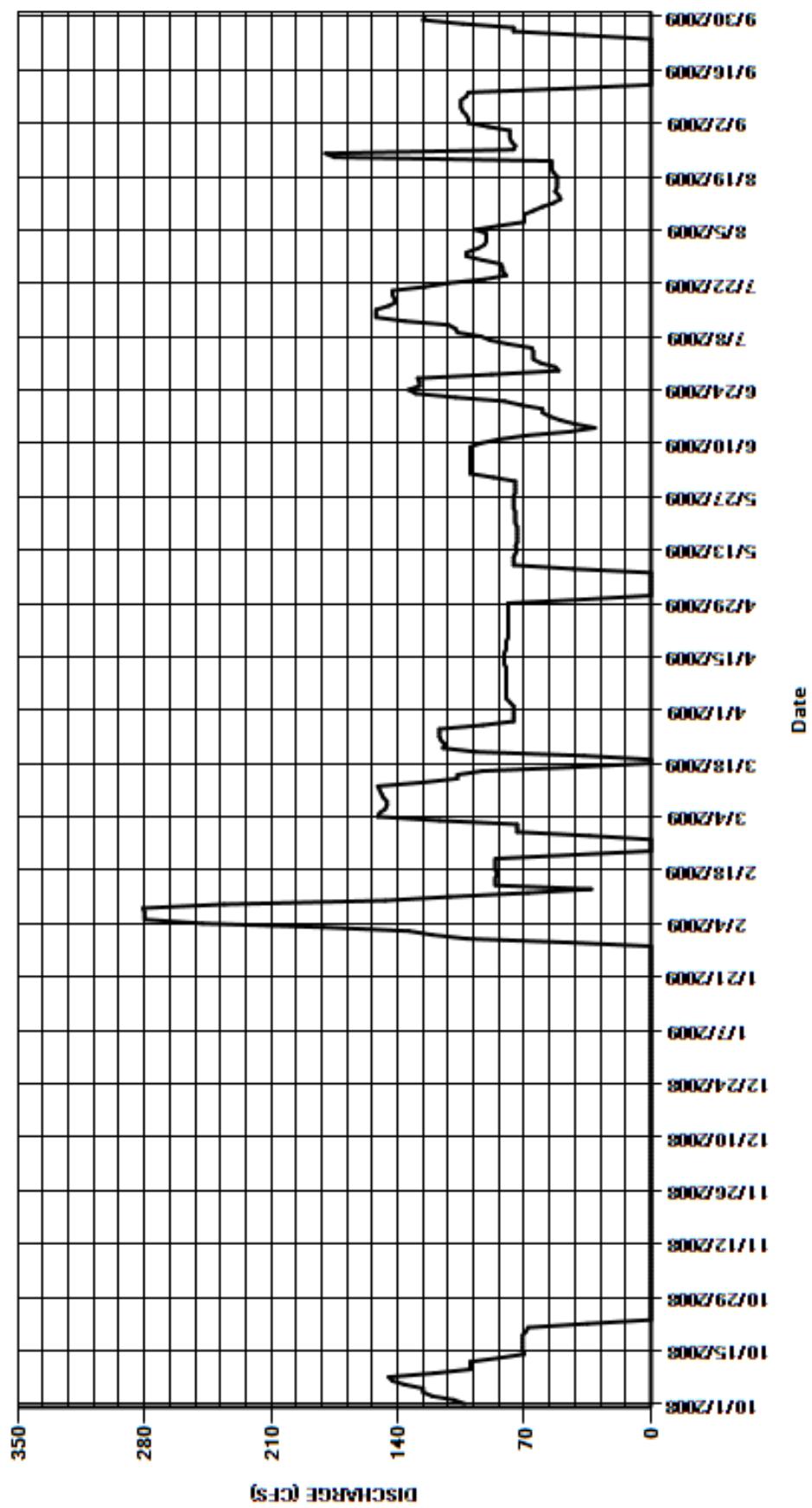
CAL YR	2008	TOTAL	31498.00	MEAN	86.1	MAX	296	MIN	0	AC-FT	62480
WTR YR	2009	TOTAL	22622.00	MEAN	62	MAX	281	MIN	0	AC-FT	44870

MAX DISCH: 322 CFS AT 07:30 ON Aug. 25,2009 GH 3.34 FT. SHIFT 0 FT.

MAX GH: 3.34 FT. AT 07:30 ON Aug. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
Water Year 2009

Location.--	Lat. 39°55'52", Long. 105°17'43", in SE $\frac{1}{4}$ sec. 26, T.I S., R.71 W., Boulder County, Hydrologic Unit 10190005, on left bank 0.2 mi downstream from South Draw, 1.0 mi west of Eldorado Springs, 1.8 mi downstream from South Boulder diversion canal, 5.0 mi south of Boulder, and 6.7 mi downstream from Gross Reservoir.
Drainage and Period of Record.--	109 mi ² . Apr. 1888-Oct. 1892, May 1895-Sept. 1901, Aug. 1904 to present.
Equipment.--	Graphic water stage recorder and shaft encoder connected to Sutron High Data Rate (HDR) satellite monitoring DCP in metal box shelter and corrugated metal pipe well. Supplemental outside chain gage.
Hydrographic Conditions.--	Flows have been regulated since May 1, 1995, by Gross Reservoir (capacity 43,060 acre-ft) 6.7 miles above station. Channel is composed of embedded small boulders, rock and gravel. Low and medium water control are large boulders ten feet below gage. The stream banks are the control at high stages. Channel is straight for 200 ft upstream and 15 ft below gage before a bend in the river occurs. Banks are lined with willows and other vegetation, but private land and State Park land is quite manicured. The drainage area consists of 109 sq mi (from topographic map) of mountainous terrain.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data, with chart record as backup. The record is complete and reliable, except for the following periods: November 24, 26, 2008, December 1, 2008—March 15, 2009, March 26, 27, and April 1, 2, 2009, when the gage was affected by ice; April 17, 2009, when the DCP failed to transmit. This station is typically shut down through the winter months but due to a mild winter, was never closed this water year. The chart recorder was malfunctioning throughout the year and was not useful for April 17 back-up. A +0.02 ft. equipment correction was made on February 25, 2009.
Datum Corrections.--	Levels were last run on August 16, 2006. No correction was necessary at that time.
Rating.--	Control for low and medium flows is a rock and concrete core dam with hand placed rock on top about 10 feet below the gage. High water control is rock dam and stream banks. The dam is deteriorating. Rating No. 23 was used for the entire water year. No. 23 has been in use since May 23, 2003 and is defined by measurements to 555 cfs. Thirteen measurements (Nos. 479- 491) were made this year ranging in discharge from 6.51 to 367 cfs. Measurements cover the discharge range experienced for the entire year. The peak flow of 384 cfs occurred at 1615 on May 21, 2009 at a gage height of 3.01 ft. with a shift of 0.02 ft. It exceeded high water Measurement # 485, made May 21, 2009, by 0.04 ft. in stage.
Discharge.--	Shifting control method was used all year. Shifts are caused by accumulation of rocks in the channel and by the gradual deterioration of the rocks piled up that act as the control. Unadjusted shifts ranged between -0.10 ft. and 0.02 ft. All were given full weight, except for measurement nos. 480, 481, 490, and 492 which were adjusted up to 5 % to smooth shift distribution. Shifts were distributed by both time and stage. Shifts were distributed by time proration for the period Oct 1-Nov 5, 2008. Shifts were distributed by stage using two variable stage shift relationships: BOCELSICOVST01, applied from Nov 5 2008-May 21, 2009, and based on Msmt. Nos 479-487 (Msmt. Nos.479 – 485 were performed during the period of use and Msmt. Nos. 486 and 487 were performed later in the same year); and, BOCELSICOVST02, applied from May 21 – Sept 30, 2009, and based on Msmt. Nos 484-492 (Msmt. Nos.485– 492 were performed during the period of use and Msmt. Nos. 484 was performed earlier in the same year).
Special Computations.--	A mass balance spreadsheet was used to identify and estimate ice days along with consideration to temperature. The South Boulder Creek Diversion (BOSDELCO) approximately 2 miles upstream of the gage, has been subtracted from the total release out of Gross Reservoir which is recorded at the station below the dam (BOCBGRCO). The remainder of flow left in the channel will be equal to that of the BOCELSICO station plus or minus any natural gain or loss along the way. The mass balance shows good correlation thru the year with the gage and has been used to fill in missing or suspect data. In the case of December 9-11, and March 25, 26, some additional flow was presumed due to heavy snowfall. Discharge for April 17, 2009 was estimated from adjacent good data and comparison to the mass balance remainder.
Remarks.--	The record is good, except for the following periods which were estimated and considered fair: November 24 and 26, 2008; December 1-8, 2008; December 12, 2008 – March 15, 2009; March 1, 11–14, 2009, and April 1-2, 2009. December 9-11 and March 26, 27 and April 17 are estimated and poor. Station maintained and record developed by Patrick Tyler.
Recommendations.--	The channel and station have deteriorated over the last few years. Plans are to relocate the gage in 2010 approximately one mile upstream.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS

RATING TABLE--

BOCELSKO23 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

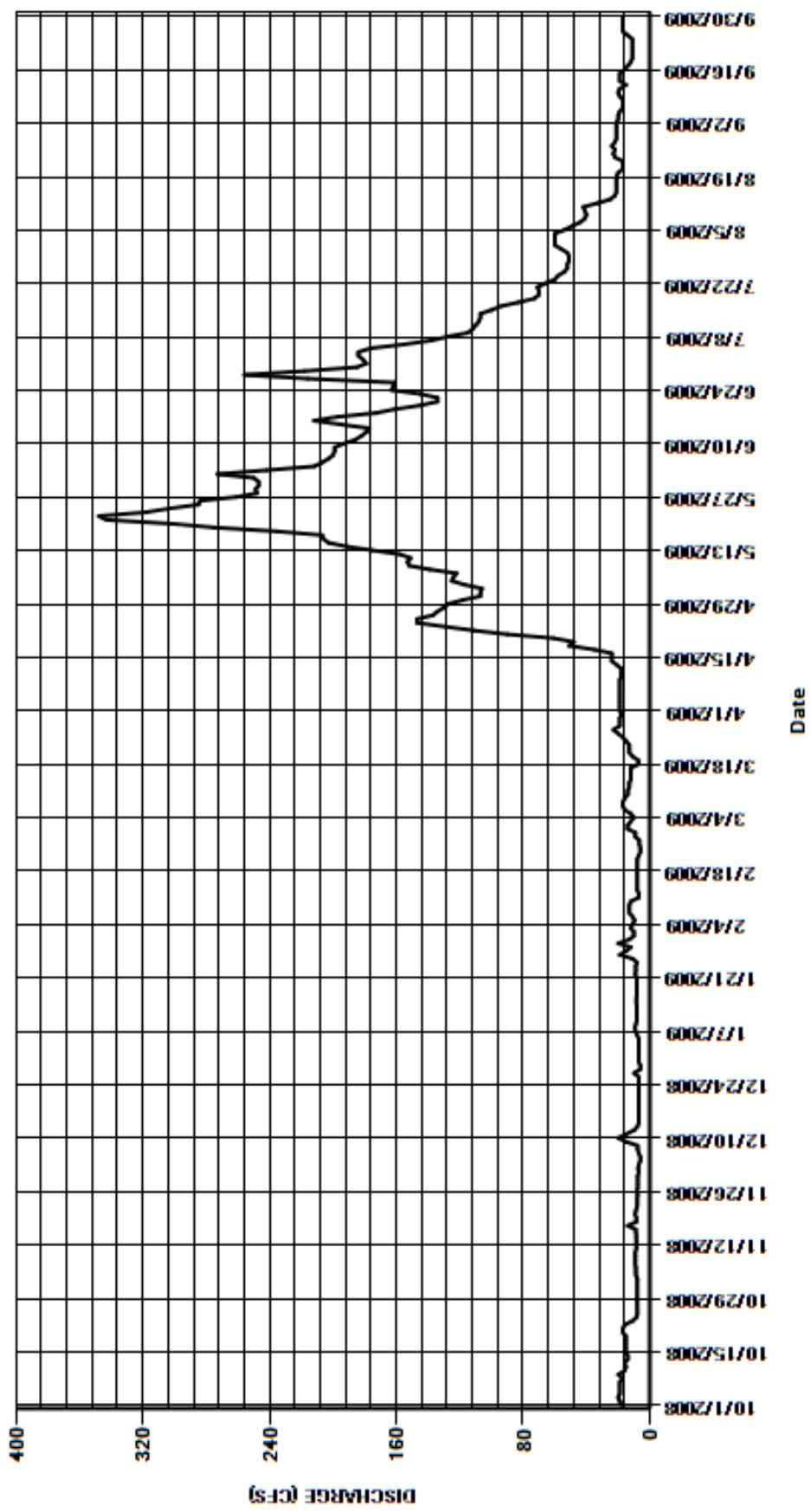
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	8	7	7	10	14	19	107	250	179	60	21
2	19	8	7.4	7	10	14	19	107	273	181	60	21
3	20	7.9	7	7	12	12	19	106	242	184	60	20
4	19	8.7	6	7	11	10	19	117	212	184	60	20
5	19	8.7	6	7	9.6	12	19	125	207	176	54	19
6	19	8.8	7	8	11	16	19	124	203	155	49	17
7	19	9.3	7.7	9.1	13	17	19	122	200	138	44	17
8	17	9.1	7.7	9.4	13	17	19	139	199	128	41	17
9	20	9.1	15	8.7	13	16	19	152	199	115	40	19
10	16	9.2	20	8.1	12	14	18	153	193	112	41	20
11	15	8.5	15	8.2	7	14	18	151	186	110	42	19
12	16	8.4	10	8.1	7	13	18	158	182	108	33	15
13	14	8.4	7.8	8.3	8	13	21	175	179	107	25	19
14	14	8.6	7	8.4	8	12	24	191	177	107	22	19
15	15	8.7	7	8.4	8	12	24	203	195	100	21	19
16	15	8.7	7	8.4	8	12	24	206	212	94	21	16
17	15	14	7	8.3	8	12	35	207	197	83	21	14
18	15	8.6	7	8.2	8	7.1	51	236	173	73	21	12
19	15	8.4	7	8.2	8	7.3	48	275	161	70	21	11
20	17	9.3	7	8.1	8	11	61	302	145	70	20	11
21	17	8.8	7	8.3	8	13	90	343	134	71	17	11
22	16	8	7	9.2	7	13	111	348	134	66	17	11
23	11	8	7	8.8	6	13	129	318	145	60	17	11
24	8.5	8	7	9	6	15	147	303	163	58	22	11
25	7.8	7.7	7	8	6.6	17	147	285	162	54	23	14
26	7.8	8	7	11	6.6	20	137	284	161	52	22	17
27	8	7.7	10	19	9.3	23	134	261	216	52	24	17
28	8	7.7	6	15	9	19	130	248	256	51	22	17
29	8	7.7	6	12	---	19	127	249	218	51	21	17
30	8	7.7	7	20	---	19	118	247	185	52	21	17
31	8	---	7	13	---	18	---	247	---	56	21	---
TOTAL	445.1	257.7	250.6	294.2	251.1	444.4	1783	6489	5759	3097	983	489
MEAN	14.4	8.59	8.08	9.49	8.97	14.3	59.4	209	192	99.9	31.7	16.3
AC-FT	883	511	497	584	498	881	3540	12870	11420	6140	1950	970
MAX	20	14	20	20	13	23	147	348	273	184	60	21
MIN	7.8	7.7	6	7	6	7.1	18	106	134	51	17	11
CAL YR	2008	TOTAL	21354.1	MEAN	58.3	MAX	351	MIN	5	AC-FT	42360	
WTR YR	2009	TOTAL	20543.1	MEAN	56.3	MAX	348	MIN	6	AC-FT	40750	

MAX DISCH: 384 CFS AT 16:15 ON May. 21,2009 GH 3.01 FT. SHIFT 0.02 FT.

MAX GH: 3.01 FT. AT 16:15 ON May. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06730300 COAL CREEK NEAR PLAINVIEW
Water Year 2009

Location.--	Lat 39°52'40", long 105°16'39" (Eldorado Springs Quad. 1965, 1:24,000 scale) in SE1/4, NE1/4, Sec. 13, T. 2S, R. 71W, Jefferson County, on left bank 100 ft upstream from culvert on State Hwy 72, 1.2 miles south of Plainview, 5 miles downstream from Beaver Creek and 9 miles north of Golden, CO.
Drainage and Period of Record.--	15.1 mi ² ; 1959 to present.
Equipment.--	Graphic water-stage recorder, and shaft encoder (SE) connected to a Sutron Satlink Data Collection Platform (DCP) in a 42 -inch corrugated metal pipe shelter. The base gage is a metal drop tape from an adjustable Reference Point (RP) mounted on the instrument shelf with a supplemental outside staff gage located 2.5 feet downstream of the shelter. The outside staff was damaged by equipment and removed on Oct. 21, 2009. The control is a low-head concrete dam constructed with a pipe through the control to allow for better bucket measurement during low flow conditions. The pipe is plugged when measurement by bucket is not occurring.
Hydrographic Conditions.--	Mainly forested mountainous terrain above gage. The gage is located at the mouth of Coal Creek Canyon which has several small developments along the banks of Coal Creek. Gage is subject to rapid increases in stage resulting from rain events and runoff from hardened areas through the canyon. The channel is straight for approximately 100 feet upstream and approximately 100 feet downstream of the station. The stream is constrained to one channel at all stages.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data, with chart record as backup. The record is complete and reliable, except for: Dec 4, 5, 8, 9, 14, 15, 27, 28, 2008, Jan 4, 5, 6, 10, 12, 13, 25-30, Feb 2, 10, 11, 12, 14-16, 19-21, 22, 28, Mar 1, 11-14, 26, 27, 31, April 2, 5, 2009, when the gage was affected by ice. The DCP failed resulting in missing hourly values on Nov 23, 2009, April 17-18, July 14, 24, August 12, 22, 2009. Chart record was used to replace missing values without loss in accuracy. On May 29 and June 11, 2009, false rises in gage height occurred due to hydrographer activity in the channel. These affected values have been evened out with surrounding good data. Due to pipeline construction just upstream of the gage in 2008, the channel has been collecting loose gravel left by the equipment. Gage heights and measurements were affected by the amount of material moving through the channel. The channel was cleaned out on October 21, 2009. Many corrections were needed to account for the loose gravel. On July 9, 2009, gravel was cleaned away from the inlets resulting in a -0.14 ft correction. The correction was applied as a datum correction prorated back to June 11, 2009. Several small rain events occurred during this time period and it is assumed that the gravel was deposited little by little during each. On January 5 and April 29, 2009, shaft encoder adjustments were made back to the primary reference. These equipment adjustments were applied as datum corrections back to a point of matching data.
Datum Corrections.--	Levels were last run on October 14, 2009. No correction was necessary at that time. RP was found to be correct using RM 1, but 0.01 high with respect to RM 4. RM elevations may be re-established in the future
Rating.--	The control is a rock and concrete dam eleven feet below the gage. Rating Number 9, in use since April 21, 2005 was continued this year. The rating is defined by measurements to 118 cfs, using measurement 455, made on May 7, 1979. Eleven measurements (886 – 896) were made this water year ranging in discharge from 0.03 to 42.4 cfs. Measurement No. 896 was performed using a timed volumetric (bucket) methodology. All other measurements were performed using traditional current meter methods. The peak flow of 105 cfs occurred at 1815 on April 21, 2009 a gage height of 1.71 ft (gage height correction of -0.02 ft applied) with a shift of -0.05 feet.
Discharge.--	Shifting control method was used all year. Shifts are caused by accumulation of material on the control. Unadjusted shifts ranged from -0.09 to 0.00 feet. More negative shifts this year are assumed to have resulted from disruption to the gage from construction activities discussed earlier. Measurements were given full weight unless specified differently below. Shifts were distributed by time with consideration of stage for the following periods: Oct. 1, 2008 to Mar 4 2009 using measurements 885, 886, 887, 888, 889, ,890 made prior to and during this period. Shifts were distributed by stage for the period Mar. 4 – Sep 30, 2009, using a variable stage shift realtionship based on all measurements made during the period (Nos. 890-896) . All measurements were given full weight except meas. no. 893, which was adjusted 4% to better fit the shift distribution.
Special Computations.--	Discharge of the ice affected periods was estimated from adjacent periods of good record with consideration to temperature trends. Flows below 1 cfs were particularly sensitive since there is not much rating definition. Measurements in the 0.4 cfs range went from a -0.07 ft shift to zero after the gravel was cleaned out, and the effective GH of zero flow also changed at least that much.
Remarks.--	The record is rated fair due to gravel moving through the control section, except for periods of ice effect, which were estimated and poor. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Effort should be made to obtain high water measurement as most of the annual flow occurs during the peak event periods. The channel was cleaned out on Oct. 21, 2009. Hydrographer should be diligent on the removal of gravel as it comes into the stilling pool and collects on the control. Levels should be run again. The staff should be re-installed. PZF on the control should be verified, and the MSL elevation from the temporary RM established by the 2008 pipeline contractor should be transferred to one of the gage RM's.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06730300 COAL CREEK NEAR PLAINVIEW

RATING TABLE--

COCREPCO09 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

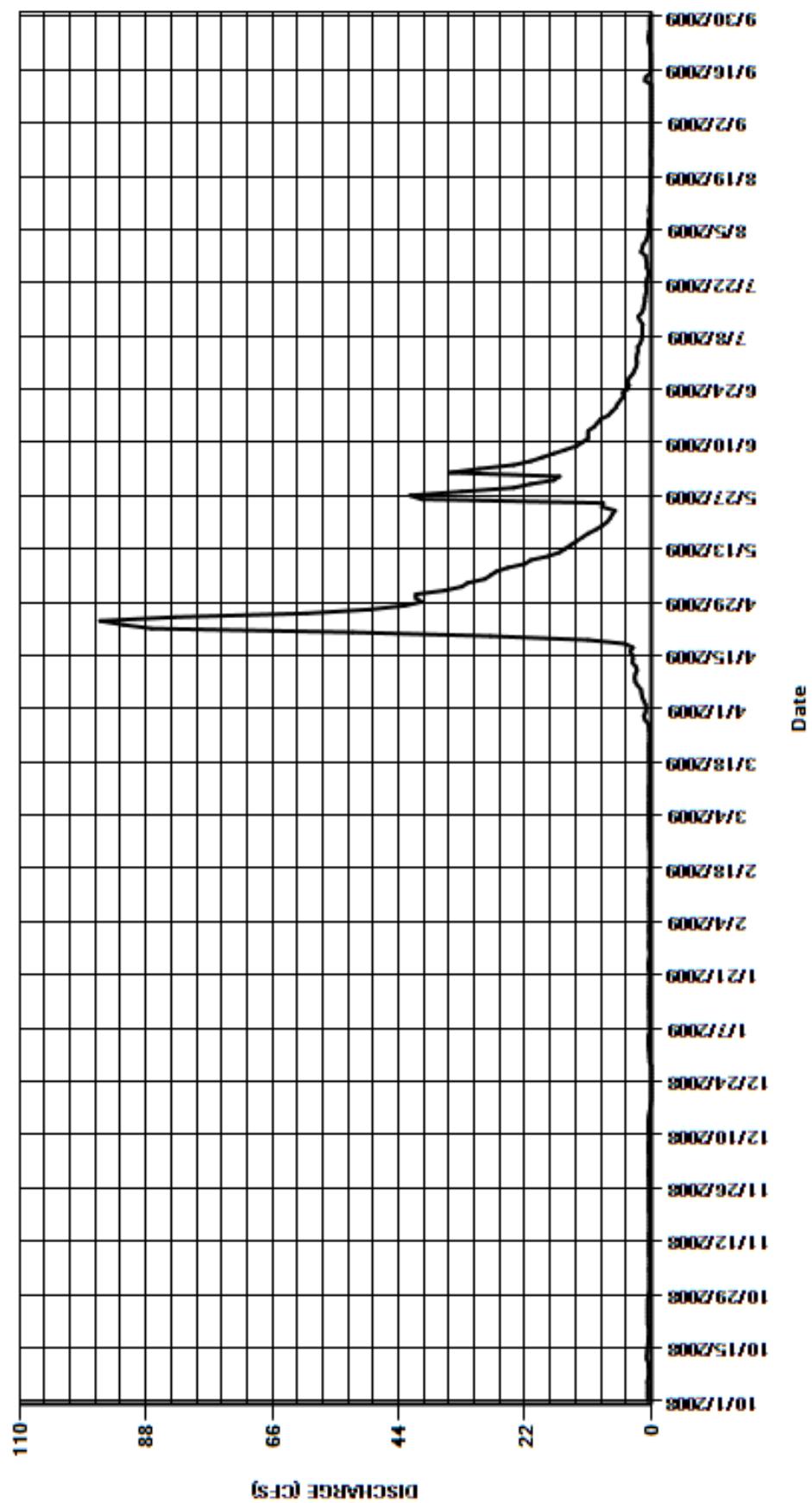
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.63	0.36	0.48	0.42	0.4	0.4	0.93	41	16	2.5	1.4	0
2	0.62	0.39	0.48	0.5	0.4	0.44	1	36	35	2.6	0.93	0
3	0.65	0.39	0.48	0.52	0.4	0.48	1.3	33	30	2.5	0.66	0
4	0.63	0.4	0.4	0.5	0.34	0.5	1.6	32	24	2.3	0.56	0
5	0.63	0.4	0.5	0.5	0.33	0.47	1.7	29	21	2.4	0.43	0
6	0.68	0.36	0.55	0.3	0.34	0.43	1.8	28	19	1.9	0.44	0
7	0.52	0.34	0.55	0.31	0.36	0.48	2.4	27	17	1.7	0.58	0
8	0.47	0.4	0.5	0.32	0.4	0.38	2.8	25	15	1.6	0.33	0
9	0.47	0.4	0.4	0.36	0.41	0.44	2.9	22	13	1.6	0.29	0
10	0.51	0.41	0.48	0.4	0.4	0.41	2.8	21	12	1.6	0.4	0
11	0.56	0.44	0.57	0.33	0.4	0.4	2.5	18	11	1.5	0.27	0
12	0.8	0.4	0.54	0.4	0.4	0.4	2.7	16	11	2	0.2	0
13	0.78	0.4	0.55	0.4	0.37	0.38	3.3	15	11	2.3	0.17	1.1
14	0.69	0.44	0.5	0.4	0.4	0.4	3.2	14	10	1.7	0.14	1
15	0.66	0.37	0.4	0.44	0.4	0.37	3.3	13	9.4	1.4	0.11	0.17
16	0.59	0.38	0.29	0.46	0.3	0.37	3.7	12	8.9	1.3	0.1	0.06
17	0.52	0.39	0.18	0.41	0.32	0.36	3.2	11	7.5	1.1	0.1	0.08
18	0.5	0.37	0.08	0.4	0.31	0.42	4.6	9.7	6.9	1.1	0.11	0.11
19	0.44	0.37	0.03	0.39	0.3	0.4	11	8.6	6.2	0.96	0.08	0.12
20	0.46	0.47	0	0.34	0.3	0.41	28	7.7	5.9	0.83	0.09	0.12
21	0.61	0.46	0	0.34	0.3	0.42	52	7.2	5.4	0.94	0.07	0.16
22	0.59	0.46	0	0.44	0.3	0.42	87	6.8	4.8	0.91	0.04	0.22
23	0.62	0.47	0	0.55	0.32	0.41	92	6.3	5	0.73	0.03	0.37
24	0.62	0.4	0	0.52	0.34	0.35	96	8.6	4.1	0.52	0.05	0.55
25	0.62	0.44	0	0.4	0.39	0.32	83	8.4	3.9	0.5	0.07	0.45
26	0.62	0.42	0	0.3	0.47	0.4	60	40	4.2	0.82	0.06	0.34
27	0.6	0.47	0	0.3	0.44	0.4	49	42	3.8	0.78	0.03	0.24
28	0.58	0.46	0	0.4	0.4	0.59	43	33	3.2	0.94	0.01	0.25
29	0.45	0.49	0.28	0.4	---	1.1	40	24	2.9	1	0	0.25
30	0.38	0.55	0.31	0.4	---	1.3	41	21	2.6	1.8	0.02	0.24
31	0.37	---	0.33	0.37	---	1	---	17	---	1.6	0.02	---
TOTAL	17.87	12.50	8.88	12.52	10.24	15.05	727.73	633.3	329.7	45.43	7.79	5.83
MEAN	0.58	0.42	0.29	0.4	0.37	0.49	24.3	20.4	11	1.47	0.25	0.19
AC-FT	35	25	18	25	20	30	1440	1260	654	90	15	12
MAX	0.8	0.55	0.57	0.55	0.47	1.3	96	42	35	2.6	1.4	1.1
MIN	0.37	0.34	0	0.3	0.3	0.32	0.93	6.3	2.6	0.5	0	0

CAL YR	2008	TOTAL	507.43	MEAN	1.39	MAX	8.3	MIN	0	AC-FT	1010
WTR YR	2009	TOTAL	1826.84	MEAN	5.01	MAX	96	MIN	0	AC-FT	3620

MAX DISCH: 105 CFS AT 18:15 ON Apr. 21,2009 GH 1.71 FT. SHIFT -0.05 FT. (GH CORR. OF -0.02 FT APPLIED)
 MAX GH: 1.71 FT. AT 18:15 ON Apr. 21,2009 (GH CORR. OF -0.02 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06730300 COAL CREEK NEAR PLAINVIEW
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO
Water Year 2009

Location.-- Lat. $40^{\circ}15'29''$, Long. $104^{\circ}52'45''$, in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 3, T,3 N., R.67 W., Weld County, Hydrologic Unit 10190005, on right bank 140 ft downstream from bridge on county road, 1.3 mi upstream from mouth, and 4.2 mi northwest of Platteville.

Drainage and Period of Record.-- 976 mi 2 . 1927 to present.

Equipment.-- Sutron Model 8210 Data Collection Platform (DCP) with HDR GOES Radio and shaft encoder (SE) and a continuous graphical water-stage recorder in a 54 inch metal pipe shelter and well equipped with inlet flushing provisions. The primary reference is an Electric Tape Gage (ETG), located inside the shelter. No usable outside staff gage.

Hydrographic Conditions.-- Drainage area is from the Saint Vrain Creek and Boulder Creek drainage basins. The channel substrate is composed mainly of sand and lays downstream of many agricultural and municipal diversions. Several inflows occur upstream of the gage. A county bridge located approximately 100 feet upstream of the gage does affect flows at all stages and has fostered the development of a sand bar at the gage location. During the sustained low flows of 2002 the datum of the gage had to be lowered 1.0 foot on April 11, 2002. Additionally, a supplementary bubble gage was used to record flows when the stage was below the inlets. Fortunately, the channel appears to be stabilizing over the past few years. Therefore the datum of the station was re-indexed using the 1.0 foot correction initially made on April 11, 2002. Re-indexing occurred on May 14, 2007.

Gage-Height Record.-- The primary record is hourly averages of 15-minute telemetered data with chart record as backup. The record is complete and reliable, except for periods when the gage-height was affected by ice: Dec 4, 5, 15-27, 2008, January 3, 4, 24-29, Mar 27, 28, 2009. Checks between the primary and backup records agreed within +/- 0.02 feet. Instrument calibration is supported by 20 logged visits made to the gage this year. No corrections were made this water year.

Datum Corrections.-- Levels were not run this water year. Levels were last run on May 14, 2007 to the inside gage (ET index) using R.M. #3 as base. No corrections were made as the ETG index was found to be within allowable tolerances.

Rating.-- Control is a sand channel with well-defined banks. The bridge above the gage has straightened the flow and is causing sand bars at the gage and downstream of the center abutment. Shifts are caused by scour and fill. In the past the rating has been affected by bank stabilization activities by the landowner on the far bank. A new rating, No. 28, was created and used for the entire water year. It is defined by measurements from 33 to 1660 cfs. Sixteen measurements (Nos. 928-943) were made this year, ranging in discharge from 62 to 926 cfs. Measurements made this water year cover the range in stage except for higher flow days of June 3, 22-29, 2009. The peak flow of 1760 cfs occurred at 0630 on June 28, 2009 at a stage of 6.95 ft. with a shift of 0.00 feet. The peak exceeded the highest measurement Number 936 by 1.83 ft in stage.

Discharge.-- Shifting control method was used. Shift proration was by time. Consideration to stage was given during the peak period. Unadjusted shifts ranged from -0.05 to +0.07 feet. The largest positive shift of +0.07 (Meas. No. 940) was made after a period of long sustained high flows which scoured the channel causing a larger than 'normal' positive shift. The movement of sand through the control area of the gage causes shifting away from the rating. Fill and scour of sand are typically rain event or run-off driven. Measurements 935 – 939, 944 were adjusted up to 1% to a zero shift to fit the new rating. High measurements 935 and 939 were adjusted plus and minus 0.7% to an average for the new rating. Measurement 931 was adjusted 2% to a zero shift to better fit distributions.

Special Computations.-- Discharges for periods of ice effect were estimated and evaluated as follows. Dec. 4, 5: Record figures used but rated fair due to possible ice. December 15-27: Record is estimated and poor with estimates derived from the following: partial record Dec. 15, 16; an ice-free visit GH on Dec 23 with a computed flow of 135 cfs; adjacent record Dec. 28; and discharge trends before and after the period. January 3, 4: Record figures used but rated fair due to possible ice. January 24-29: Discharge trends before and after period and adjacent good record; estimated and poor. March 27, 28: Record figures used but rated fair due to possible ice. A digital hydrograph is provided.

Remarks.-- The record is good except the following days: December 4, 5; January 3, 4; and March 28, 29 are fair due to possible ice effect, while December 15-27 and January 24-29 are estimated and poor due to ice effect. Station maintained by Patrick Tyler and Lee Cunning and record developed by Lee Cunning.

Recommendations.-- More measurements would be desirable especially at higher stages (above 3.00 feet of stage). Identify the high water controlling feature. More visits would be helpful in the winter to evaluate ice conditions.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO

RATING TABLE--

SVCPLACO28 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

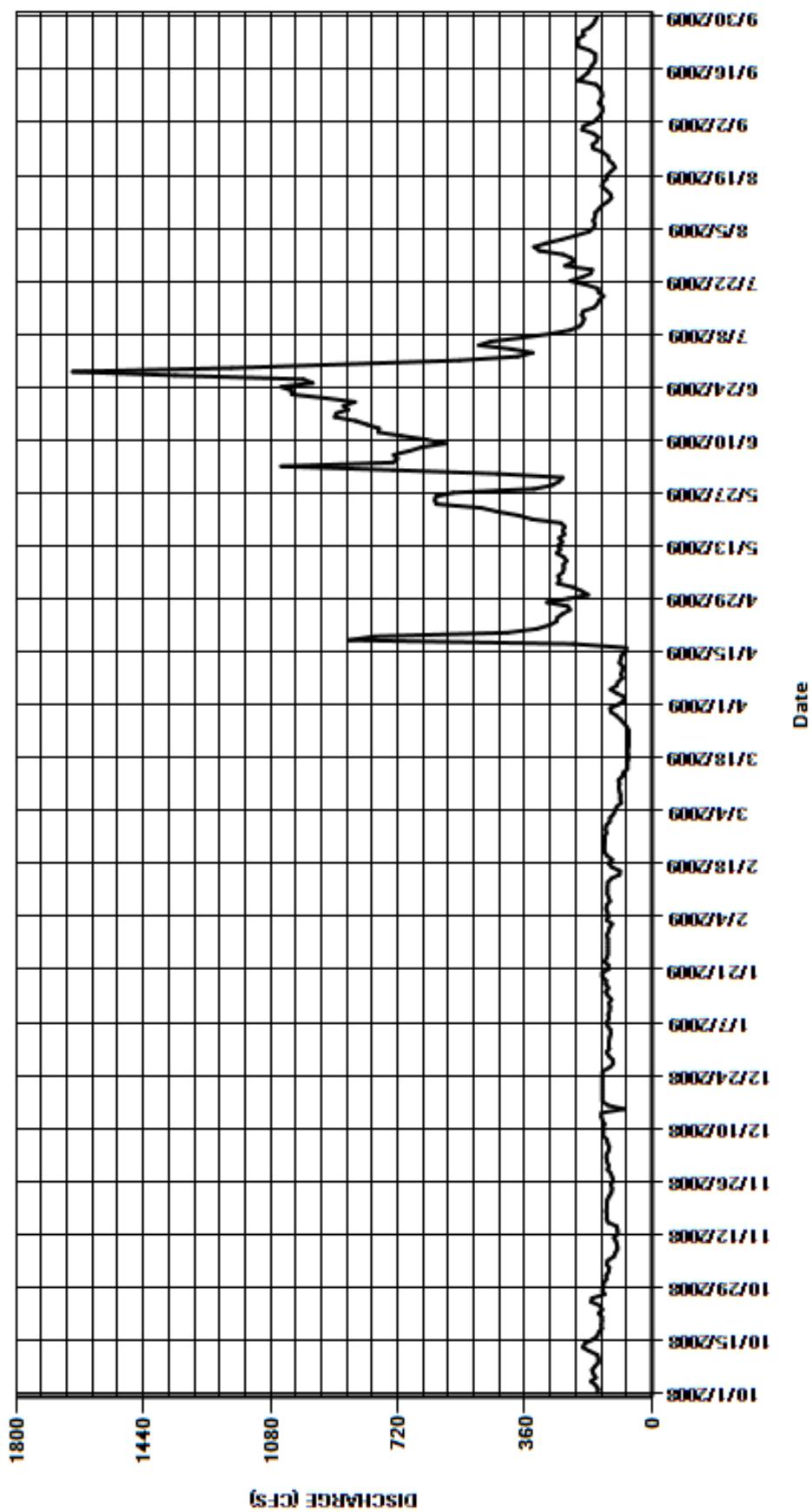
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	155	130	127	123	120	120	95	199	437	545	299	193
2	153	123	129	122	113	119	80	223	732	380	255	166
3	160	121	129	120	129	109	78	267	1050	338	216	154
4	173	129	123	117	123	105	100	261	733	399	179	145
5	159	125	121	118	126	100	118	266	721	490	165	140
6	166	108	126	126	130	87	100	252	732	456	162	141
7	170	104	128	127	128	90	96	250	688	367	166	151
8	161	98	139	122	119	89	84	251	653	288	161	145
9	152	99	138	124	123	92	88	242	588	232	161	141
10	152	102	139	120	127	94	84	250	636	205	151	143
11	155	108	135	119	126	92	83	270	709	196	141	149
12	178	97	140	122	126	95	92	260	775	192	125	159
13	196	98	144	115	125	84	89	266	773	199	115	209
14	191	100	143	125	115	81	86	254	806	195	118	195
15	169	124	80	131	92	70	74	263	839	164	129	182
16	155	129	125	123	91	70	73	248	898	154	142	176
17	151	127	140	131	114	69	223	253	894	149	140	170
18	142	130	140	130	123	66	859	247	860	137	129	161
19	144	128	140	141	113	68	786	258	874	152	127	160
20	142	128	140	141	127	69	409	340	841	153	116	160
21	142	127	140	124	135	66	326	379	923	187	104	177
22	151	121	140	123	135	66	290	438	1020	232	111	209
23	141	115	140	135	135	65	270	485	1020	198	123	211
24	147	113	140	128	133	66	268	611	1050	173	125	210
25	172	117	140	125	135	65	253	615	961	170	139	193
26	170	110	120	125	129	71	232	612	987	246	166	197
27	134	113	110	125	132	79	239	563	1350	223	169	177
28	141	117	111	125	130	89	297	334	1640	227	156	166
29	137	126	122	125	---	100	236	282	1190	252	152	160
30	138	122	129	128	---	116	181	263	864	319	166	155
31	129	---	121	123	---	119	---	253	---	334	198	---
TOTAL	4826	3489	4039	3883	3454	2671	6289	9955	26244	7952	4806	5095
MEAN	156	116	130	125	123	86.2	210	321	875	257	155	170
AC-FT	9570	6920	8010	7700	6850	5300	12470	19750	52050	15770	9530	10110
MAX	196	130	144	141	135	120	859	615	1640	545	299	211
MIN	129	97	80	115	91	65	73	199	437	137	104	140
CAL YR	2008	TOTAL	50797	MEAN	139	MAX	1030	MIN	56	AC-FT	100800	
WTR YR	2009	TOTAL	82703	MEAN	227	MAX	1640	MIN	65	AC-FT	164000	

MAX DISCH: 1760 CFS AT 06:30 ON Jun. 28,2009 GH 6.95 FT. SHIFT 0 FT.

MAX GH: 6.95 FT. AT 06:30 ON Jun. 28,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
WIND RIVER NEAR ESTES PARK
Water Year 2009

Location.-- Lat. 40°19'38", Long. 105°34'53"

Drainage and Period of Record.-- 4.6 sq. mi.

Equipment.-- Sutron 56-0540 shaft encoder connected to a Satlink satellite monitoring data collection platform (DCP) with GOES transmitter in a 4-foot by 4-foot wooden shelter at a 4-foot steel Parshall flume. The gage is also equipped with a standalone Sutron Stage Discharge Recorder (SDR) (Model No: SDR-0001-1). An electric tape gage (ETG) located on the instrument shelf is the primary reference; a supplemental staff gage is located at the flume's left Ha location. The station is maintained in cooperation with the United States Bureau of Reclamation (USBR) and Colorado Division of Water Resources (DWR) to determine east slope diversions into the Colorado Big Thompson Project system from Wind River.

Hydrographic Conditions.-- Upstream drainage area consists of forested lands. A small reservoir is located upstream of the gage diverting approximately 300 Acre Feet (AF) of domestic water a year. This gage is used to compute the amount of native east slope water (Wind River) water being diverted or "skimmed" into the Colorado-Big Thompson (C-BT) system at Adams Tunnel. Wind River is gaged above (WINDESCO) and below (WINBYPSCO) Adams Tunnel. The amount of water being taken into Adams Tunnel is the difference between the two gages. Thus, Wind River Skim = WINDESCO-WINBYPSCO. When water is not being skimmed, all flow by-passes Adams Tunnel through a buried pipeline where the WINDBYPSCO gage measures and records the same water as the WINDESCO flume. The USBR does not divert flow into the C-BT system if the native flow in Wind River is 2 cfs or less. Skim operations are not performed in the winter.

Gage-Height Record.-- The record is hourly averages of 15-minute satellite data with SDR data as back up. The record is complete and reliable, except for: Oct 23, Nov 6-8, 14-15, 21-25, 2008, Apr 17-19, 2009, when the flume was ice affected; Nov 26, 2008 through April 7, 2009, the station was closed for winter, no winter record maintained ; November 26, 2008 and April 7, 2009 are partial day records; July 18-20, 2009, debris in the flume caused erroneous gage-height values recorded . Missing hourly data occurring on April 18-20, 2009 was filled in with SDR data without loss of accuracy. Additionally, erroneous or a disagreeing minimum stage value on November 12, 2008 was edited to values recorded by the SDR. A flume cleaning correction of -0.01 feet occurred on May 6, 2009. The correction was determined to be insignificant to the overall accuracy of the gage and was therefore ignored. Instrument calibration was ensured and validated by 49 visits made to the gage by DWR and USBR staff. Instrument calibration of the shaft encoder, SDR and base gage were within +/- 0.01 feet. "Skim" operations occurred from May 7, 2009 (11:00) to July 15, 2009 (08:00).

Datum Corrections.-- On October 31, 2008 level computations indicate that the gage was found to read 0.008 feet high with respect to R.M. 5. Levels run on October 15, 2009 confirmed the October 31, 2008 findings and a correction of -0.01 feet was made to the tape length on October 15, 2009. Datum correction to the 2009 stage data and measurement gage-heights was not done per agreement with the USBR. The tape change will be confirmed prior to the 2010 gage opening. A tape length correction of -0.01 ft was made on October 15, 2009. During the October 31, 2008 levels effort, two additional reference marks (RM) were established (R.M. 6 and 7). R.M.6, a bolt placed in the right edge of water upstream wing wall, was found to be as established. However; R.M. 7, a bolt placed in a boulder on the left edge of water upstream from the shelter, was reassigned from an elevation of 2.200 feet to 2.190 feet following the October 15, 2009 levels run. It is suspected that R.M.7 was disturbed when USBR staff removed deposited material from the flume stilling basin.

Rating.-- The control is a 4-foot metal Parshall flume. A standard 4-foot Parshall Flume rating (STD04FTPF) was used this year. The standard rating is well defined for the range of flow experienced this year except for average daily stage values falling below 0.20 feet of stage. Below this threshold the rating has been extrapolated downward to a stage of 0.00 feet. Average daily stage values below 0.20 feet occurred between: October 1, 2008 through November 26, 2008; April 7, 2009 through April 23, 2009 and August 7, 2009 through September 30, 2009. Five measurements were made this water year (Nos. 120-124) ranging in discharge from 4.02 to 6.62 cfs. Msmt. Nos. 121 and 122 were not considered in preparation of this record, as they were performed for training purposes, and as such were discounted as any systematic or computational errors from these measurements should not be applied to the record. The peak flow of 8.91 cfs occurred at 2245 on June 11, 2009 at a stage of 0.69 feet with a shift of 0.00 ft.

Discharge.-- Measurements made this year as well as previous measurements showed no trends toward permanent shift conditions. Unadjusted shifts ranged from 0.00 feet to -0.02 feet. As per agreement with the USBR and Water Commissioner, discharge measurements within +/-5% of the rating are adjusted to the rating. As such, Measurement Nos. 120 and 123 were adjusted from computed shifts of -0.01 and -0.02 feet to a zero shift requiring adjustments of -5% and -6% respectively. The rating was applied directly to gage height record to compute discharge. Flows during the winter period are not recorded because of heavy ice conditions. Discharges during the winter months are insignificant and generally less than 2 cfs. The USBR is required to leave at least 2 cfs minimum flow in Wind River when they are diverting flow into the CBT or "skimming". Skimming operations occurred between May 7, 2009 (11:00) and July 15, 2009 (08:00) as per USBR water order No. 09-219 and USBR provided accounting logs. Average daily flows at both the WINDESCO and WINBYPSCO gages were in excess of 2.0 cfs during this period. A total of 520 AF was taken from the Wind River drainage into the C-BT system this year.

Special Computations.-- October 23, 2008; November 6-8, 14-15, 21-25, 2008; April 17-19, 2009: Flume was ice affected, discharge values were estimated from adjacent periods of good record with respect to temperature trends for November 6-8, 14-15. For November 21-25, 2008 and April 17-19, 2009 values were estimated without loss of accuracy from good periods of record at the downstream gage (WINBYPSCO). November 26, 2008 through April 7, 2009, the station was closed for winter, no winter record maintained . November 26, 2008 and April 7, 2009: Partial day record, discharge values were estimated from partial day stage values with respect to previous / subsequent full day records. July 18-20, 2009: debris in the flume, discharge values taken from the WINBYPSCO gage without loss of accuracy. "Skim" operations had ended prior to this date. Data validation between the WINDESCO and WINBYPSCO gage was good prior to accumulation and following the removal of the debris .

Remarks--

This is a partial year record. Period of record for Water Year 2009 is October 1 to November 26, 2008 and April 6 to September 30, 2009. The record is good, except as follows. Using the USBR Water Measurement Manual, Figure 8-9, Page 8-44, the range of measurement accuracy of a 4-foot Parshall flume is 1.3 cfs to 67.9 cfs corresponding to gage-heights of 0.20 feet and 2.50 feet, respectively. Above or below this range is outside the 5% accuracy range. Given this fact, flows below 1.3 cfs or a gage-height of 0.20 feet, occurring: October 1-November 26, 2008; April 7-23, and August 7-September 30, 2009 are considered fair. Record is considered fair on October 23, 2008; November 6-8, 14-15, when the flume was ice affected. Record is estimated and poor on November 21-25, 2008; April 17-19, 2009, when the flume was ice affected. Record is estimated without loss of accuracy from the downstream gage (WINBYPCO). November 26, 2008 through April 7, 2009; Station closed for winter, no winter record maintained. November 26, 2008 and April 7, 2009; Partial day record. Record is estimated and poor. Formerly called "Wind River Near Estes Park" this gage is operated as part of the Colorado-Big Thompson system to track water "skimmed" into the C-BT system for power generation purposes. Skimming operations occurred between May 7, 2009 (11:00) and July 15, 2009 (08:00) diverting 520 Acre Feet (AF) into the C-BT system. Station maintained and record developed by Russell Stroud.

Recommendations--

More discharge measurements should be made. ETG tape should be replaced as it has several splices in its medial section. Levels should be run in the 2010 water year to monitor reference mark stability. Levels should use flume crest as base in order to verify established elevations for all reference marks.

STATE OF COLORADO
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WIND RIVER NEAR ESTES PARK

RATING TABLE--

STD04FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.81	0.66	---	---	---	---	---	2.8	7.3	5.5	1.5	0.65
2	0.76	0.68	---	---	---	---	---	3.1	7.4	5.4	1.4	0.71
3	0.85	0.74	---	---	---	---	---	3.4	7.5	5.2	1.3	0.58
4	0.79	0.64	---	---	---	---	---	3.7	7.6	5.2	1.2	0.61
5	0.79	0.67	---	---	---	---	---	3.9	7.7	4.9	1.3	0.64
6	0.8	0.65	---	---	---	---	---	4.2	7.8	4.7	1.2	0.69
7	0.8	0.65	---	---	---	---	0.4	4.6	7.9	4.3	1.2	0.64
8	0.76	0.65	---	---	---	---	0.39	4.9	8	4.2	1.2	0.58
9	0.76	0.64	---	---	---	---	0.4	4.8	8.2	3.8	0.99	0.64
10	0.79	0.74	---	---	---	---	0.35	4.7	8.2	3.7	0.95	0.6
11	0.72	0.55	---	---	---	---	0.42	4.2	8.4	3.5	0.96	0.57
12	0.78	0.62	---	---	---	---	0.34	4	8.3	3.5	0.95	0.62
13	0.73	0.68	---	---	---	---	0.45	4.3	8	3.3	0.87	0.56
14	0.78	0.6	---	---	---	---	0.47	4.6	7.8	3.1	0.96	0.52
15	0.75	0.6	---	---	---	---	0.47	4.5	7.8	2.9	0.91	0.6
16	0.75	0.62	---	---	---	---	0.45	4.7	7.5	2.7	0.84	0.52
17	0.73	0.63	---	---	---	---	0.5	4.8	7.4	2.6	0.87	0.59
18	0.66	0.59	---	---	---	---	0.6	5	7	2.5	0.86	0.52
19	0.72	0.61	---	---	---	---	0.4	5.4	6.9	2.4	0.81	0.47
20	0.76	0.6	---	---	---	---	0.44	5.7	6.9	2.2	0.79	0.53
21	0.73	0.57	---	---	---	---	0.74	6.1	6.7	2.1	0.75	0.55
22	0.67	0.53	---	---	---	---	0.91	6.2	6.6	2.1	0.73	0.57
23	0.61	0.46	---	---	---	---	1.1	6.2	6.3	2	0.72	0.51
24	0.72	0.46	---	---	---	---	1.6	6.2	6.4	1.9	0.73	0.56
25	0.66	0.49	---	---	---	---	1.9	6.2	6.2	1.8	0.78	0.52
26	0.66	0.5	---	---	---	---	1.8	6.6	6.3	1.9	0.78	0.45
27	0.7	---	---	---	---	---	1.7	6.5	6	1.9	0.7	0.48
28	0.7	---	---	---	---	---	1.9	6.7	6	1.8	0.69	0.51
29	0.71	---	---	---	---	---	2.1	6.8	5.7	1.8	0.72	0.55
30	0.7	---	---	---	---	---	2.5	6.9	5.5	1.9	0.71	0.52
31	0.71	---	---	---	---	---	---	7.1	---	1.5	0.7	---
TOTAL	22.86	15.83	---	---	---	---	22.33	158.8	215.3	96.3	29.07	17.06
MEAN	0.74	0.61	---	---	---	---	0.93	5.12	7.18	3.11	0.94	0.57
AC-FT	45	31	---	---	---	---	44	315	427	191	58	34
MAX	0.85	0.74	---	---	---	---	2.5	7.1	8.4	5.5	1.5	0.71
MIN	0.61	0.46	---	---	---	---	0.34	2.8	5.5	1.5	0.69	0.45

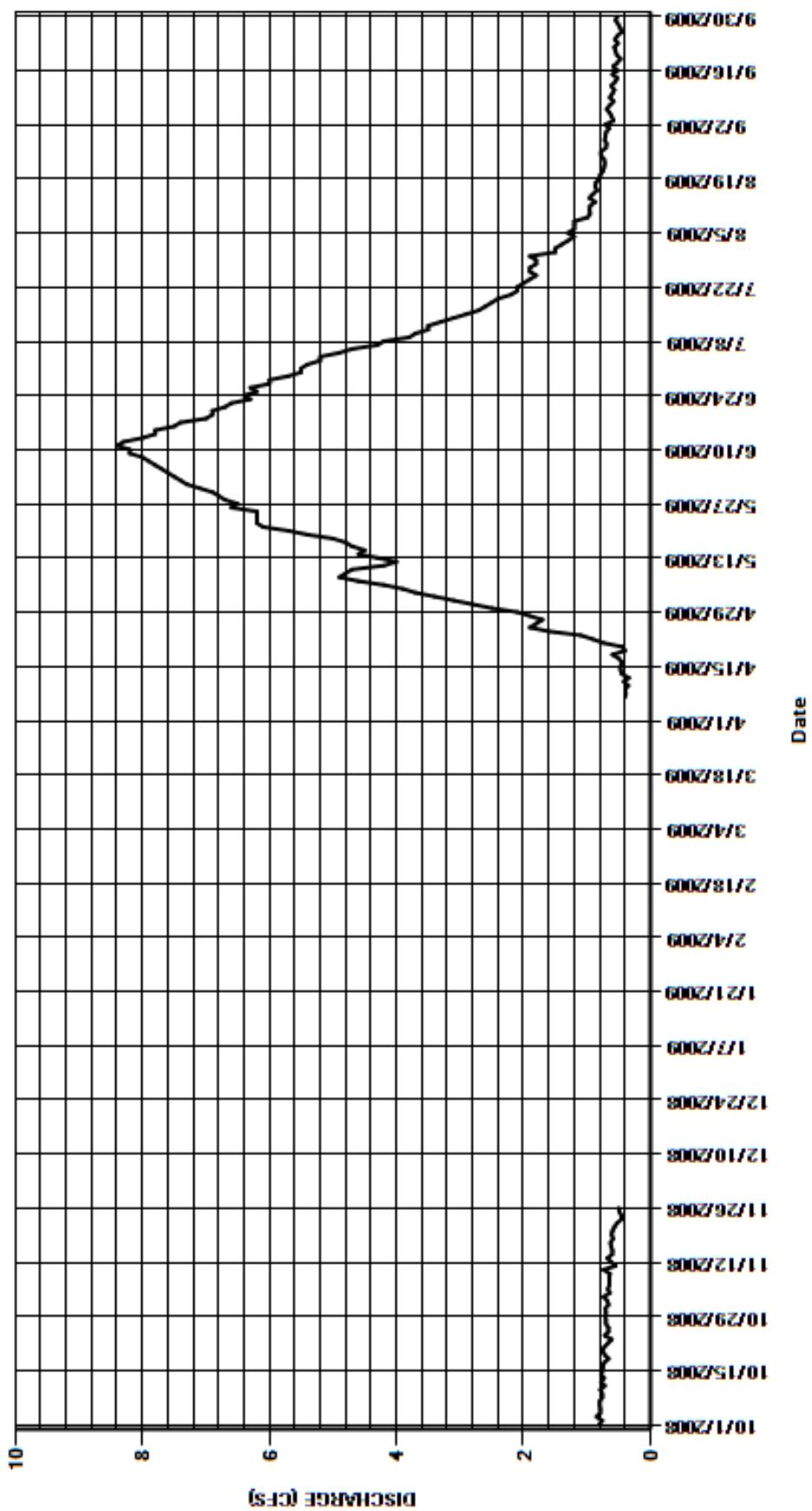
CAL YR	2008	TOTAL	439.97	MEAN	2	MAX	6.7	MIN	0.46	AC-FT	873 (PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	577.55	MEAN	2.47	MAX	8.4	MIN	0.34	AC-FT	1150 (PARTIAL YEAR RECORD)

MAX DISCH: 8.9 CFS AT 22:45 ON Jun. 11,2009 GH 0.69 FT. SHIFT 0 FT.

MAX GH: 0.69 FT. AT 22:45 ON Jun. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WIND RIVER NEAR ESTES PARK
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

WIND RIVER BYPASS

Water Year 2009

Location.-- Lat. 40°19'38", Long. 105°34'53"

Drainage and Period of Record.-- 4.6 sq. mi.

Equipment.-- Sutron Stage Discharge Recorder (SDR) (Model: SDR-0001-1) in a steel corrugated metal pipe (CMP) shelter with a steel CMP well and a metal drop tape and nonadjustable reference point at a 3-foot Cipolletti weir. The drop tape is the primary reference; a supplemental staff gage is located in the weir pool adjacent to the shelter. A buried data line runs from the WINBYPSCO shelter to the Data Collection Platform (DCP) at Adams Tunnel (ADATUNCO) gage where stage data is recorded and transmitted hourly via a Sutron 8210 / Sutron SatLink GOES transmitter. This gage is operated in cooperation of the Colorado Division of Water Resources and the United States Bureau of Reclamation (USBR).

Hydrographic Conditions.-- Drainage area consists of forested lands of varying topography adjacent to Rocky Mountain National Park. A small reservoir located upstream of the gage diverts approximately 300 Acre Feet (AF) of domestic water a year. Alva B. Adams Tunnel stilling reservoir is also located upstream of the gage. This gage is used to compute the amount of native east slope water (Wind River) water being diverted or "skimmed" into the Colorado-Big Thompson (C-BT) system at Adams Tunnel. Wind River is gaged above (WINDESCO) and below (WINBYPSCO) Adams Tunnel. The amount of water being taken into Adams Tunnel (ADATUNCO) is the difference between the two gages. Thus, Wind River Skim = WINDESCO-WINBYPSCO. When water is not being skimmed, all flow by-passes Adams Tunnel through a buried pipeline where the WINBYPSCO gage measures and records the same water as the WINDESCO flume. The USBR does not divert flow into the C-BT system if the native flow in Wind River is 2 cfs or less. Skim operations are not performed in the winter. Adams Tunnel can also release water to the Wind River Below Adams Tunnel channel as required for maintenance or safety concerns. The ADATUNCO stilling basin is equipped with a head gate and spillway; which, when in use, places water upstream of the WINDESCO control structure. Skimming operations of Wind River occurred from May 7, 2009 (11:00) through July 15, 2009 (08:00).

Gage-Height Record.-- The record is hourly averages of 15-minute satellite data with the SDR logged data as backup. The gage-height record was evaluated for the entire period of record (October 1, 2008 to November 26, 2008 and May 6, 2009 to September 30, 2009) but only utilized from November 4-17, 2008, November 21-26, 2008, and the "skim" period: May 7-July 15, 2009. The record is complete and reliable for the periods of use.

Datum Corrections.-- Levels were run from the weir crest (gage datum 0.00 feet) to the base and supplemental gages on October 15, 2009. No correction was necessary to the base gage. However, the supplemental staff gage was found to be 0.066 feet lower than the weir crest. The staff was not corrected in lieu of impending gage winterization.

Rating.-- The control is a 3-foot Cipolletti weir. A standard 3-foot Cipolletti weir rating (STD03FTCIP) was used for the skim portion of the year. Two measurements (Nos. 8 and 9) were made this year with measured discharge values of 2.09 and 4.00 cfs respectively. The peak discharge of 4.35 cfs occurred at 1615 on May 6, 2009 at a stage of 0.57 ft with a shift of 0.00 ft. It exceeded Msmt. No 8 made 5-hours earlier by 0.03 feet of stage.

Discharge.-- As per agreement with the USBR discharge measurements within +/- 5% of the rating are adjusted to the rating. As such, measurement No. 9 was adjusted -4% from a computed shift of -0.01 feet to a zero shift. The rating was applied directly to recorded gage-height values for the periods of use: November 4-17, 21-26, 2008, May 7 (11:00) to July 15 (08:00), 2009. Discharge values for all other periods were taken directly from the WINDESCO record. Differences in discharge values between the WINDESCO and WINBYPSCO records occurring from November 11 to 18, 2008 is due to slight drainage accruing to the stream from the ADATUNCO gage basin. During this period WINBYPSCO recorded discharge values greater than those recorded at the WINDESCO gage. May 6, 2009 was the start-up day for the WINBYPSCO gage. WINDESCO discharge values were used for the daily discharge, but the peak was taken from partial day record from WINBYPSCO.

Special Computations.-- Computed discharge values were compared to computed WINDESCO discharge values for data validity purposes. Discharge values from WINDESCO were used for all "non-skim" portions of the year with exception to WINDESCO ice affected periods of October and November, 2008 and the WINDESCO debris affected period occurring in July, 2009.

Remarks.-- This is a partial year record. Period of record for Water Year 2009 is October 1 to November 26, 2008 and April 7 to September 30, 2009. Formerly called "Wind River By-Pass" the gage is operated as part of the Colorado-Big Thompson system, to track water" skimmed" into the C-BT system for power generation purposes. Skimming operations occurred between May 7, 2009 (11:00) and July 15, 2009 (08:00) diverting 520 AF of water into the C-BT system for power generation purposes. The record was developed using both the WINDESCO and WINBYPSCO gages. The WINBYPSCO gage was used to compute discharge values from: November 4 to 17, 2008, November 21 to 26, 2008 and May 7, 2009 (11:00) to July 15, 2009 (08:00). WINDESCO discharge values were used for all other portions of the year. The record is good, except for as follows: October 1- November 4, November 18-20, 2008; April 7-23, and August 7-September 30, 2009 (WINDESCO): record is considered fair. November 26, 2008 through April 7, 2009, the station was closed for winter, no winter record maintained. November 26, 2008 and April 7, 2009, partial day records, estimated and poor. April 17-19, 2009 gage was ice affected (WINDESCO), record is estimated and poor. Station maintained and record developed by Russell V. Stroud.

Recommendations.-- Levels should be run in the spring to monitor instability from frost heaving. Addition of secondary reference marks should be done at the time levels are next run. Careful examination of skim balance should be made on real time basis. Photographs of the gage, control and channel should be taken to update and augment the Station Description.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WIND RIVER BYPASS

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.81	0.66	---	---	---	---	---	2.8	2.2	2.4	1.5	0.65
2	0.76	0.68	---	---	---	---	---	3.1	2.2	2.4	1.4	0.71
3	0.85	0.74	---	---	---	---	---	3.4	2.2	2.3	1.3	0.58
4	0.79	1.4	---	---	---	---	---	3.7	2.3	2.1	1.2	0.61
5	0.79	1.3	---	---	---	---	---	3.9	2.4	2.1	1.3	0.64
6	0.8	1.2	---	---	---	---	---	4.2	2.3	2.3	1.2	0.69
7	0.8	1.1	---	---	---	---	0.4	3.2	2.3	2.3	1.2	0.64
8	0.76	1.2	---	---	---	---	0.39	2	2.4	2.3	1.2	0.58
9	0.76	1.1	---	---	---	---	0.4	1.6	2.4	2.2	0.99	0.64
10	0.79	1.2	---	---	---	---	0.35	1.5	2.4	2.1	0.95	0.6
11	0.72	1.1	---	---	---	---	0.42	1.8	2.4	2.1	0.96	0.57
12	0.78	1.2	---	---	---	---	0.34	1.9	2.4	2.2	0.95	0.62
13	0.73	1.2	---	---	---	---	0.45	2.2	2.2	2.1	0.87	0.56
14	0.78	1.2	---	---	---	---	0.47	2.2	2.1	2.1	0.96	0.52
15	0.75	1.2	---	---	---	---	0.47	2.2	2.3	2.6	0.91	0.6
16	0.75	1.2	---	---	---	---	0.45	2.2	2.4	2.7	0.84	0.52
17	0.73	0.98	---	---	---	---	0.5	2.1	2.1	2.6	0.87	0.59
18	0.66	0.59	---	---	---	---	0.6	2	2.1	2.5	0.86	0.52
19	0.72	0.61	---	---	---	---	0.4	2	2.2	2.4	0.81	0.47
20	0.76	0.6	---	---	---	---	0.44	2.1	2	2.2	0.79	0.53
21	0.73	0.57	---	---	---	---	0.74	2.1	2	2.1	0.75	0.55
22	0.67	0.53	---	---	---	---	0.91	2.5	1.9	2.1	0.73	0.57
23	0.61	0.46	---	---	---	---	1.1	2.3	2.1	2	0.72	0.51
24	0.72	0.46	---	---	---	---	1.6	2.2	2.1	1.9	0.73	0.56
25	0.66	0.49	---	---	---	---	1.9	2.2	2.1	1.8	0.78	0.52
26	0.66	0.5	---	---	---	---	1.8	2.2	2.1	1.9	0.78	0.45
27	0.7	---	---	---	---	---	1.7	2.2	2.1	1.9	0.7	0.48
28	0.7	---	---	---	---	---	1.9	2.4	2.1	1.8	0.69	0.51
29	0.71	---	---	---	---	---	2.1	2.4	2.3	1.8	0.72	0.55
30	0.7	---	---	---	---	---	2.5	2.3	2.4	1.9	0.71	0.52
31	0.71	---	---	---	---	---	---	2.2	---	1.5	0.7	---
TOTAL	22.86	23.47	---	---	---	---	22.33	75.1	66.5	66.7	29.07	17.06
MEAN	0.74	0.9	---	---	---	---	0.93	2.42	2.22	2.15	0.94	0.57
AC-FT	45	47	---	---	---	---	44	149	132	132	58	34
MAX	0.85	1.4	---	---	---	---	2.5	4.2	2.4	2.7	1.5	0.71
MIN	0.61	0.46	---	---	---	---	0.34	1.5	1.9	1.5	0.69	0.45

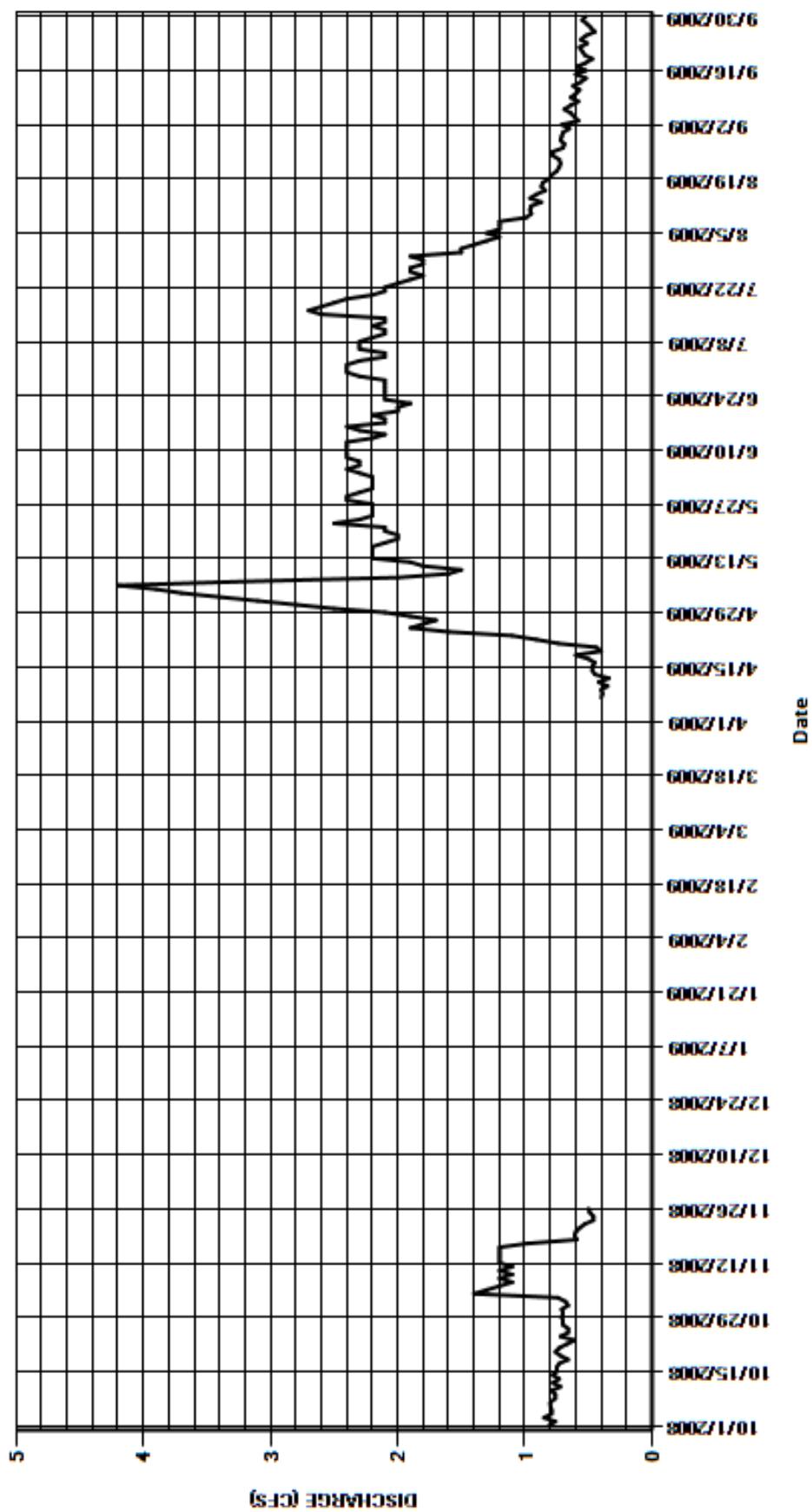
CAL YR	2008	TOTAL	311.11	MEAN	1.41	MAX	3.1	MIN	0.46	AC-FT	617	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	323.09	MEAN	1.38	MAX	4.2	MIN	0.34	AC-FT	641	(PARTIAL YEAR RECORD)

MAX DISCH: 4.3 CFS AT 18:00 ON May. 06,2009 GH 0.57 FT. SHIFT 0 FT.

MAX GH: 0.57 FT. AT 18:00 ON May. 06,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WIND RIVER BYPASS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES
Water Year 2009

Location.-- Lat. $40^{\circ}22'42''$, Long. $105^{\circ}30'48''$, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 30, T.5 N., R.72 W., Larimer County on right bank in Estes Park, 600 ft downstream from bridge on State Highways 7 and 66, 900 ft downstream from Black Canyon Creek, and 0.3 mi northwest of Estes Power Plant. Station is upstream from Lake Estes.

Drainage and Period of Record.-- 137 mi². October 1946 to current year.

Equipment.-- Quadrature Sutron shaft encoder (SE), Sutron Tipping Bucket rain gage and temperature sensor connected to a Sutron 8210 Satellite monitoring Data Collection Platform (DCP) and a Sutron Stage Discharge Recorder (SDR) in a four foot by four foot precast concrete shelter and stilling well at a 15-foot concrete Parshall flume with overflow bays flanking the flume. A/C power and telephone services are provided by the US Bureau of Reclamation (USBR). The well is attached to the channel via one two-inch and two three-inch valved inlets, one inlet connects the well to the flume at its Ha location and two inlets connect the channel to the well at the shelter location. The inlets directly connecting the channel to the well are closed unless the flume is in "overflow operation" meaning the overflow bays (weirs) are in effect. Moreover, the Ha inlet is closed when the overflow bays are in use. The primary reference is an electric tape gage (ETG) located in the shelter with two supplementary outside staff gages. One supplementary staff is located at the flume's left Ha location and the second staff is located on the stream ward side of the shelter. The second staff (high water staff) is only used with the flume is in overflow operation. The gage is maintained in cooperation with the USBR and the Colorado Division of Water Resources (DWR).

Hydrographic Conditions.-- Drainage area consists of forested mountain terrain, mostly in Rocky Mountain National Park. Spring runoff displays a snowmelt diurnal. The gage is downstream of the bulk of Estes Park, CO and is also susceptible to rapid increases in stage due to storm runoff events from hardened surfaces within the town. Higher than normal approach velocities due to channel grade are present at the flume and are suspected to cause positive shifting. Moreover, sand and gravel accumulation upstream of the flume are also suspected of causing positive shifting conditions as water is not allowed to "still" adequately before entering the flume. The town of Estes Park placed several bank stabilization keystone boulders in the channel at an unknown date from January, 2008 to April 2008. The concept was to stabilize the left bank by diverting flow energy back to the center of the channel. However, the installation of the energy diversion structures was executed incorrectly causing flow energy to divert towards the left bank, which propagates through the flume. Gage-height readings at the Ha staff often read higher than the base gage. Moreover, at higher flows side-to-side velocity bias and stage stack-up can be seen across the flume's crest by visual inspection.

Gage-Height Record.-- The primary record is hourly averages of 15-minute data, taken from the DCP with logged SDR data as backup. Frequent visits by USBR and DWR personnel showed good agreement between sensors and base gages all year. The record is complete and reliable, except for: December 3-8, 2008 when the flume and/or inlet/stilling well were affected by ice; December 9, 2008 through April 7, 2008 when the gage was off-line for winter and no gage-height data were collected. One hourly value (07:00 June 27, 2009) the instruments counter-weights were found to be interfering with the float movements. Observation made earlier that day (06:00) showed good agreement. Issue was corrected at 07:30. Peak stage of 5.38 feet occurred on June 27, 2009 (02:45) as recorded by the SE. A -0.01 ft instrument correction was applied later that day. If the instrument had been in good calibration the instantaneous peak stage values would have agreed with the peak stage values recorded by the SDR; 5.37 feet, June 27, 2009 (02:45).

Datum Corrections.-- Levels were last run on October 30, 2008 to run to verify gage and flume stability after flume floor refurbishment in WY08. Evidence of structure settlement was found. The Ha staff was found to be -0.008 feet below the average flume crest, the high-water staff was found to be -0.006 feet below the crest and ETG was found 0.006 feet above the average crest elevation. Adjustment to the base and supplemental gages was not performed following the October 30, 2008 level run. Levels will be run prior to opening this gage for the 2009 water year and adjustment of the base and supplemental gages will be reevaluated.

Rating.-- The control is a 15-foot Parshall flume with overflow weirs flanking both sides. The concrete flume floor was degrading with substantial spalling throughout the flume prior to flume reconstruction beginning in September, 2007. Rating No. 9 in use since October 1, 1971 was continued this year. The rating has a break point (away from the standard Parshall) above five feet in stage when flow begins to surround the flume and go over the overflow bays. The upper section of the rating was confirmed by a 1220 cfs measurement in 2003. Eighteen discharge measurements (Nos. 602-619) were performed this year ranging in discharge from 15.6 to 870 cfs. Three measurements (Nos. 609, 610, 613) were performed with a Teledyne RD Instruments StreamPro Acoustic Doppler Current Profiler (ADCP) a newer technology for measuring stream discharge. The peak discharge of 1000 cfs occurred at 0245 on June 27, 2009 at a stage of 5.37 ft (gage height correction of -0.01 ft applied) with a shift of +0.30 ft. It exceeded measurement No. 614 made later that day by 0.33 feet in stage. The peak stage and subsequent observation at 06:00 showed that the flume was in overflow operation. The gage's inlets were not changed to the upstream configuration since the peak event was transitory and short in duration. As such, the peak stage and peak discharge are somewhat suspect. Note: The USBR requested that no winter measurements be performed in the flume due to concerns of damaging the newly placed concrete. As such, no measurements were made during ice conditions.

Discharge.--

Shifts at this gage result from movement of sand, gravel and boulders into and out of the stilling basin upstream of the flume, causing variable and abnormally high approach velocities. Bank stabilization/erosion control structures placed in the channel upstream of the flume also have an effect on the stage-discharge relationship. The stilling basin was cleaned by USBR personnel at some point in October 2008. However, cleaning of the basin did not yield to the desired outcome. Since cleaning of the basin excessive amounts of sediment have deposited directly upstream from the flume. As such water entering the flume has higher approach velocities due to inadequate stilling and non-laminar conditions which contribute to deviations from the standard Parshall rating. It is postulated that changes to approach conditions resulting from sediment conditions listed above as well as other mechanisms discussed earlier (e.g. bank stabilization keystone structure) may be both transient and related to stage and are affecting the stage discharge relationship at this gage. The combination of these conditions is presumed to have caused stronger deviation away from the standard Parshall rating. Shifting control method was used. Unadjusted shifts ranged from 0.02 to 0.35 ft. From October 1 through December 3, 2008 and April 7 through May 6, 2009, shifts were prorated by time with consideration to stage. Measurements 603 and 604 were made back-to-back and were adjusted plus and minus to the same shift. Shifts were distributed by stage from May 6, 2009 through the end of the water year (September 30, 2009) using variable shift table BTABESCOVS09-01, defined by thirteen measurements (Nos. 607-620) made during the period of use and adjacent water year (No. 620). Measurement No. 613 was deemed unreliable and was therefore not considered in this analysis. All measurements were given full weight except for: Nos. 609 and 610 both ADCP measurements made back to back. Measurements were adjusted 3% and -2% from computed shifts of +0.32 and +0.22 feet, respectively; to a mean shift of 0.26 feet. No. 612 was adjusted 2% from a computed shift of 0.35 feet to 0.30 feet to better fit the stage-shift distribution. Msmt. No. 613 an ADCP measurement, was deemed unreliable and insufficient and was therefore not considered. No. 615 was adjusted -2% from a computed shift of 0.24 feet to 0.28 feet to better fit the stage-shift distribution.

Special Computations.--

Discharge values for the winter period (December 3, 2008 through April 7, 2009) were taken from USBR provided accounting (enclosed). The USBR computes the native inflow to Lake Estes based on gaged outflows (BTABLESCO and OLYTUNCO) correlating the net outflow to reservoir elevation changes at Lake Estes. This computed flow is the summation of all sources of unaccounted-for water into Lake Estes, including local runoff. The SDR log was manually edited for Daylight Savings (DLS) time adjustments. Time adjustments were made to the SDR instrument however the adjustments were made several days following the prescribed change; thereby, requiring manual adjustment of logged time and stage values in the intervening days until the instrument was physically adjusted.

Remarks.--

The record is good except as follows: December 3-8, 2008; when the gage was ice affected, discharge values were estimated and are fair; December 9, 2008 through April 7, 2009, when the gage was off for winter, discharge is estimated and fair; June 27, 2009; peak stage and peak discharge are somewhat suspect. Observations made at 06:00 showed that the flume was in overflow status at a stage of 5.26 feet. Inlets were not switched to the upstream configuration since peak event was transitory. Regardless, the recorded peak stage and computed peak discharge are suspect and therefore downgraded to fair. Station maintained and record developed by Russell V. Stroud.

Recommendations.--

Levels should be shot to the overflow bay crests to verify breakpoint elevation. Additionally, levels should be shot to verify the flume's lateral and longitudinal levelness and stability. Photos are needed for the flume in normal operation and with flow over the boards. Continued efforts to be made to find a cooperative solution to solving issues introduced by Estes Park's erosion control devices. Consideration should be given to place a gradient control /energy dissipation structure upstream of the flume; and to correct bank stabilization structures placed by the town of Estes Park.

STATE OF COLORADO
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06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

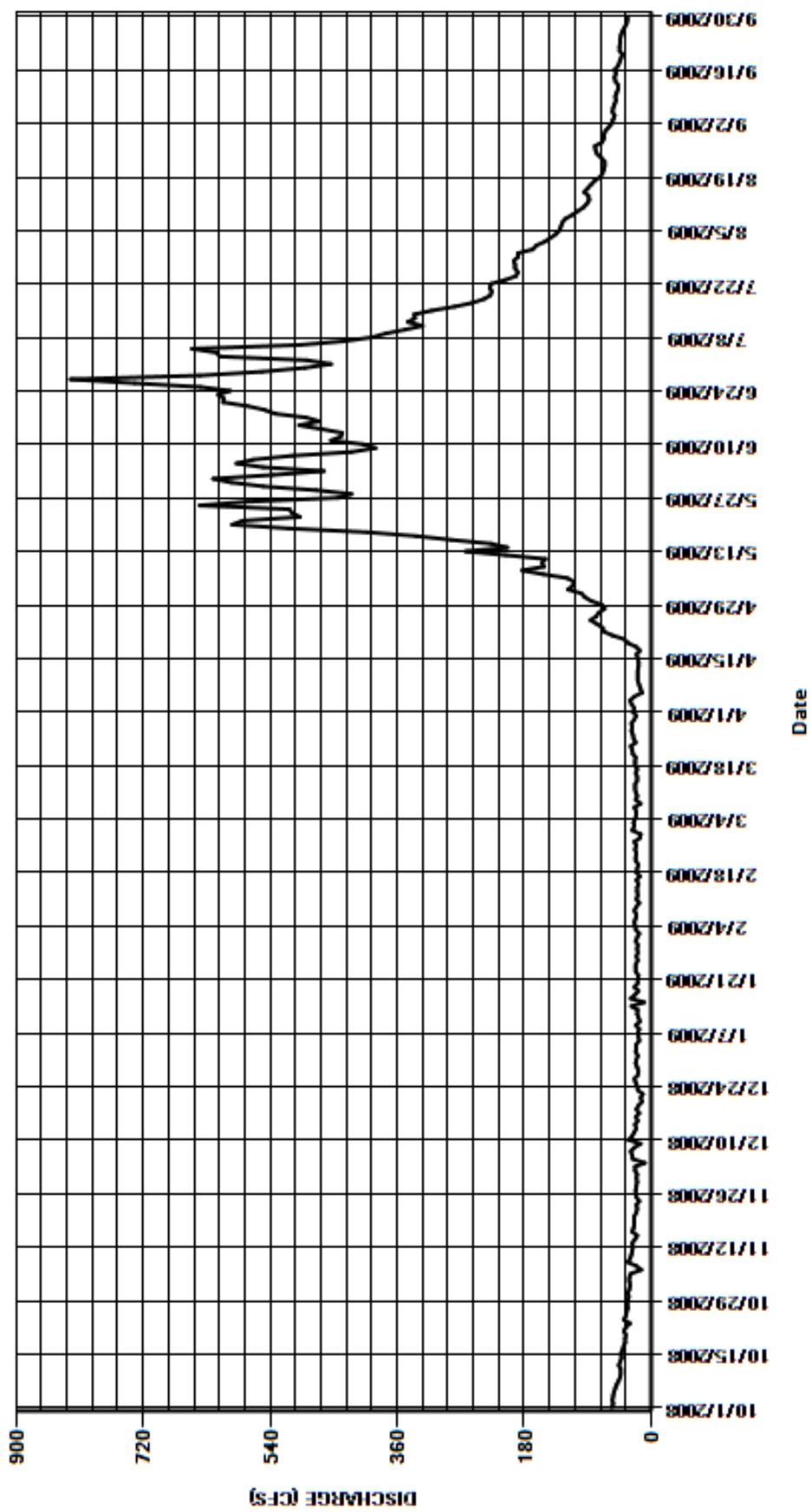
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	31	20	19	20	27	26	94	621	454	163	60
2	54	30	23	22	17	24	24	99	536	488	151	56
3	55	31	23	21	22	25	28	118	464	612	143	54
4	54	31	9	21	23	23	30	111	550	616	135	52
5	53	29	26	17	24	21	24	109	588	651	130	55
6	51	14	27	18	22	21	13	119	564	499	128	54
7	49	21	29	19	21	24	15	153	509	434	126	52
8	46	33	24	17	24	15	17	183	425	396	122	50
9	44	30	15	22	21	22	19	152	391	376	112	51
10	43	28	32	16	17	20	19	155	408	349	104	49
11	43	27	27	18	21	22	19	150	454	324	96	47
12	46	26	24	20	19	23	19	206	440	345	91	47
13	44	27	21	19	20	23	18	263	438	335	88	51
14	42	23	23	28	20	20	18	204	468	336	89	52
15	43	20	19	10	18	20	19	227	499	311	95	50
16	41	27	22	29	21	22	21	283	470	279	90	52
17	39	25	17	23	16	20	16	333	489	254	85	47
18	37	24	21	18	21	23	21	403	533	237	80	45
19	37	24	18	24	20	23	33	514	548	228	72	43
20	36	24	13	19	18	22	38	594	572	226	69	41
21	39	21	15	19	22	26	55	579	607	229	67	45
22	36	20	12	18	22	27	67	498	606	227	66	45
23	30	21	19	22	21	29	69	509	614	207	66	44
24	39	17	20	22	23	22	77	513	597	192	71	44
25	36	21	22	22	21	25	86	640	639	189	77	43
26	35	22	24	19	24	26	78	572	732	193	79	41
27	33	22	19	21	16	28	74	444	823	193	80	38
28	34	21	18	19	15	27	66	425	640	195	70	35
29	33	20	20	20	---	28	70	475	552	189	67	34
30	32	21	22	19	---	24	85	550	491	189	67	33
31	33	---	21	22	---	21	---	595	---	168	65	---
TOTAL	1293	731	645.0	623	569	723	1164	10270	16268	9921	2944	1410
MEAN	41.7	24.4	20.8	20.1	20.3	23.3	38.8	331	542	320	95	47
AC-FT	2560	1450	1280	1240	1130	1430	2310	20370	32270	19680	5840	2800
MAX	56	33	32	29	24	29	86	640	823	651	163	60
MIN	30	14	9	10	15	15	13	94	391	168	65	33

CAL YR	2008	TOTAL	42462.0	MEAN	116	MAX	656	MIN	9	AC-FT	84220
WTR YR	2009	TOTAL	46561.0	MEAN	128	MAX	823	MIN	9	AC-FT	92350

MAX DISCH: 1000 CFS AT 02:45 ON Jun. 27,2009 GH 5.37 FT. SHIFT 0.3 FT. (GH CORR. OF -0.01 FT APPLIED)
 MAX GH: 5.37 FT. AT 02:45 ON Jun. 27,2009 (GH CORR. OF -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06734500 FISH CREEK NEAR ESTES PARK
Water Year 2009

Location.-- Lat. 40°22'06", Long. 105°29'35", SW $\frac{1}{4}$ sec. 29, T.5 N., R.72 W.

Drainage and Period of Record.-- 16.9 mi². 1946 to present.

Equipment.-- Graphical chart recorder and a Sutron 56-0540 digital incremental shaft encoder (SE) connected to a high data rate Sutron SatLink 2 Data Collection Platform (DCP) in a 4 foot by 4 foot concrete shelter and stilling well at 5-foot Parshall flume. An electric tape gage located on the instrument shelf is the primary reference with a supplementary staff gage located at the flume's left Ha location. The stilling well is connected to the flume via a 2-inch inlet. Gage is owned by the United States Bureau of Reclamation (USBR) and operated by the Colorado Division of Water Resources (CDWR). USBR personnel do not visit nor maintain this station on a regular basis.

Hydrographic Conditions.-- Drainage area consists of mainly grassed and forested lands with some developed areas. Flows measured by this gage enter Lake Estes immediately downstream from the gage. Several small diversions can occur upstream from the gage.

Gage-Height Record.-- The primary record is hourly averages of 15-minute telemetered data with chart record as backup. The chart record was loosely correlated to the primary data set due to variable recorder clock issues throughout the year. The record is complete and reliable, except as follows: October 11- November 15, 2008; when the gage was backwatered by placement of absorbent materials used to remediate the channel following a fatal car accident occurring at the gage site on October 11, 2008; November 26, 2008 and April 7, 2009, partial day records; April 17-18, 2009, when the stage discharge relationship was affected by ice.

Datum Corrections.-- Levels were not run this water year. Levels were last run in March of 2005, where the gage was found to be within allowable tolerances. No changes were made.

Rating.-- The control is a 5-foot concrete Parshall flume. Rating No. 6, developed by the United States Geologic Survey in 1951 is based on a 5-foot Parshall rating below 3.5 feet of stage and was extended upwards to 7.40 feet on a basis of slope area determination at a stage of 7.32 feet, discharge 1480 cubic feet per second (cfs). Rating No. 6 was continued this year. Three discharge measurements (No. 717-179) were made this year ranging in discharge from 2.34 to 9.63 cfs. The peak flow of 12.7 cfs occurred at 2315 May 2, 2009 at a stage of 0.75 ft with a shift of 0.00 ft. It exceeded measurement No. 717 made on May 6, 2009 by 0.13 feet in stage.

Discharge.-- Unadjusted shifts have ranged from -0.01 to +0.01 feet. As per agreement with the USBR, CDWR and Water Commissioner, discharge measurement within 5% of the rating are adjusted to the rating. As such Measurement Nos. 717 and 719* were adjusted to the rating. *No. 719 was rated as a fair measurement due to measuring below the meters lower stage threshold of 0.30 feet. The measurement required an adjustment of -6.4% to adjust to the rating. The rating was applied directly to the hourly averaged gage-height data; as measurements performed this year and last year were within 5% of the rating. This is a partial year record; as such discharge for the winter period (November 27, 2008 to April 6, 2009) was not calculated nor estimated.

Special Computations.-- Using the USBR Water Measurement Manual, Figure 8-9, Page 8-44, the range of accurate discharge measurement of a 5-foot Parshall flume is 1.6 to 85.6 cfs. Anything above or below this range is outside the +/- 5% accuracy range for a standard 5-foot Parshall flume rating. As such, average daily computed discharges below 1.6 cfs, occurring: October 1 through November 26, 2008; April 7 through 19 and June 9- September 30, 2009 are considered fair.

Remarks.-- The record is rated good, except as follows: October 1-10, 2008 ; April 7-19; June 9—September 30 are rated fair due to poor definition of the flume rating at low flow.; October 11, 2008 through November 15, 2008 the record is estimated and poor due to backwater following the October 11, 2008 car accident; November 26 is fair due to partial record. This is a partial year gage and had no record for the winter period--November 27, 2008 through April 6, 2009. Station maintained and record developed by Russell V. Stroud.

Recommendations.-- More visits and measurements to this gage should be considered as time and personnel allow. Levels should be in the 2010 water year. Considerations for concrete condition degradation remediation should be made.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06734500 FISH CREEK NEAR ESTES PARK

RATING TABLE--

FISHESCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.63	0.6	---	---	---	---	---	10	5.6	1.7	0.86	0.43
2	0.65	0.6	---	---	---	---	---	11	6.5	1.7	0.76	0.4
3	0.66	0.6	---	---	---	---	---	11	5.3	1.9	0.65	0.39
4	0.65	0.6	---	---	---	---	---	10	4.8	1.9	0.63	0.39
5	0.67	0.6	---	---	---	---	---	9.6	4.6	2.2	0.64	0.39
6	0.66	0.6	---	---	---	---	---	9.3	4.3	1.8	0.69	0.58
7	0.63	0.6	---	---	---	---	0.6	8.8	4.1	1.6	0.69	0.6
8	0.61	0.6	---	---	---	---	0.8	8.3	4	1.5	0.54	0.49
9	0.64	0.6	---	---	---	---	0.76	7.9	4	1.3	0.5	0.45
10	0.66	0.6	---	---	---	---	0.67	10	4	1.3	0.5	0.44
11	0.6	0.6	---	---	---	---	0.66	9.2	4.2	1.2	0.48	0.43
12	0.6	0.6	---	---	---	---	0.68	7.8	4.2	1.2	0.44	0.45
13	0.6	0.6	---	---	---	---	0.76	6.9	3.9	1.1	0.44	0.48
14	0.6	0.6	---	---	---	---	0.72	6.3	3.7	1.1	0.48	0.48
15	0.6	0.6	---	---	---	---	0.72	5.9	3.7	0.96	0.54	0.44
16	0.6	0.66	---	---	---	---	0.76	5.7	3.6	0.88	0.5	0.45
17	0.6	0.69	---	---	---	---	0.7	5.3	3.4	0.83	0.46	0.44
18	0.6	0.64	---	---	---	---	1	5.2	3	0.83	0.48	0.44
19	0.6	0.64	---	---	---	---	1.3	4.9	2.8	0.76	0.42	0.42
20	0.6	0.65	---	---	---	---	2.4	4.6	2.7	0.69	0.38	0.41
21	0.6	0.6	---	---	---	---	3.5	4.6	2.8	0.66	0.38	0.46
22	0.6	0.61	---	---	---	---	6.1	4.7	2.6	0.68	0.37	0.52
23	0.6	0.64	---	---	---	---	7.5	4.6	2.7	0.66	0.33	0.5
24	0.6	0.6	---	---	---	---	8.4	5.9	2.5	0.64	0.32	0.51
25	0.6	0.6	---	---	---	---	9.9	5.8	2.4	0.75	0.53	0.49
26	0.6	0.6	---	---	---	---	10	6.2	2.6	0.96	0.85	0.45
27	0.6	---	---	---	---	---	10	5.3	2.3	0.87	0.67	0.39
28	0.6	---	---	---	---	---	9.9	4.5	2	1.2	0.51	0.36
29	0.6	---	---	---	---	---	9.7	4.2	1.9	1.1	0.48	0.39
30	0.6	---	---	---	---	---	10	4	1.8	1.1	0.51	0.39
31	0.6	---	---	---	---	---	---	3.9	---	0.99	0.48	---
TOTAL	19.06	15.93	---	---	---	---	97.53	211.4	106.0	36.06	16.51	13.46
MEAN	0.61	0.61	---	---	---	---	4.06	6.82	3.53	1.16	0.53	0.45
AC-FT	38	32	---	---	---	---	193	419	210	72	33	27
MAX	0.67	0.69	---	---	---	---	10	11	6.5	2.2	0.86	0.6
MIN	0.6	0.6	---	---	---	---	0.6	3.9	1.8	0.64	0.32	0.36

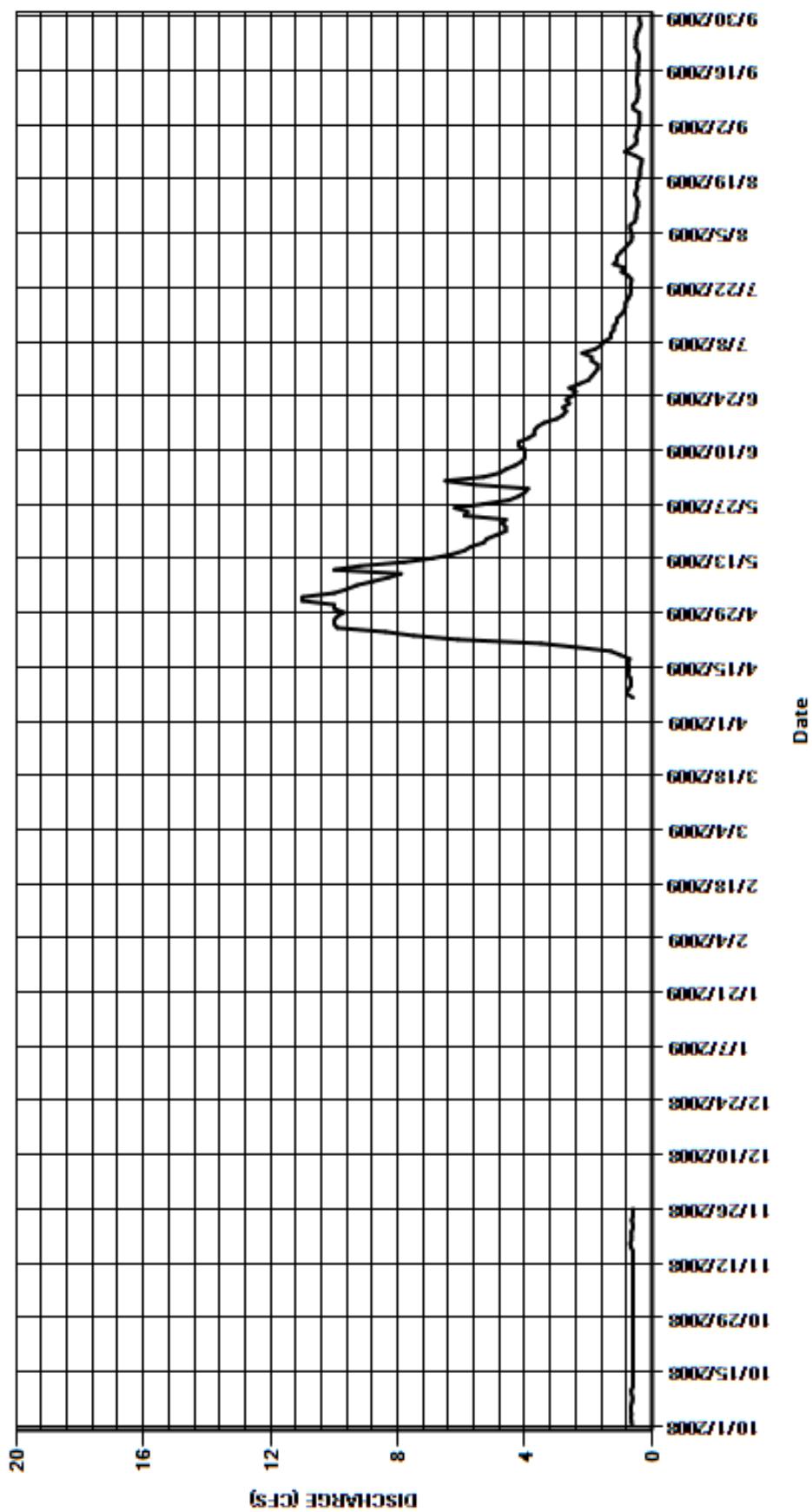
CAL YR	2008	TOTAL	307.02	MEAN	1.4	MAX	7.5	MIN	0.41	AC-FT	609 (PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	515.95	MEAN	2.2	MAX	11	MIN	0.32	AC-FT	1020 (PARTIAL YEAR RECORD)

MAX DISCH: 13 CFS AT 23:15 ON May. 02,2009 GH 0.75 FT. SHIFT 0 FT.

MAX GH: 0.75 FT. AT 23:15 ON May. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06734500 FISH CREEK NEAR ESTES PARK
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES

Water Year 2009

Location.-- Lat. 40°22'35", Long. 105°29'06", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, T.5 N., R.72 W., Larimer County, Hydrologic Unit 10190006, on right bank 100 ft upstream from Dry Gulch, 600 ft downstream from Olympus Dam, and 2.0 mi east of Estes Park.

Drainage and Period of Record.-- 155 mi². Area at site used Jan. 29, 1934 to Mar. 21, 1951, 162 mi².

Equipment.-- Design Analysis H-334 absolute shaft encoder (SE), Sutron Stage Discharge Recorder (SDR) and a Sutron 8210 high data rate satellite monitoring Data Collection Platform (DCP) in a four by four foot precast concrete shelter and stilling well at a 15-foot concrete Parshall Flume with overflow bays flanking the flume. A/C power and telephone services are present on site. The well is attached to the flume via one valved inlet, and to the channel with an additional two inlets. When in overflow conditions the flume inlet is closed and the channel inlets are opened. The primary reference is an electric tape gage (ETG) in the shelter with one supplementary outside staff gage, located on the backside of the shelter. This reference is only used in overflow conditions, when the overflow bays are in use. The gage is maintained in cooperation with the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (CDWR).

Hydrographic Conditions.-- Controlled release from Olympus Dam.

Gage-Height Record.-- The primary record is hourly averages of telemetered 15-minute data, with logged SDR data as backup. The record is complete and reliable. Good agreement between the two instruments was observed this year through frequent site visits by USBR and CDWR staff. All daily average stage values agreed between the two instruments within +/-0.02 feet except for August 28, 2009; when work was being performed on the SE, affecting the accuracy of the recorded data. SDR data was used to fill in the affected period without loss of accuracy. Due to the flume's proximity to the dam, ice accumulation in the approach, flume, and departing sections is generally not an issue. No ice was observed this year. However, the flume is subject to moss and algal growth as well as debris accumulation. Three flume cleaning corrections were made that affected this year's record (December 10, 2008, February 24, 2009, and October 27, 2009). The cleaning corrections ranged from -0.01 feet to -0.04 feet. Additionally, one instrument correction of -0.01 feet was made on December 10, 2008. The corrections were applied as datum corrections as follows: October 5 - November 18, 2008: -0.01 ft instrument correction prorated by time ; November 18 - December 10, 2008: -0.01 feet to -0.03 feet, instrument correction of -0.01 feet aggregated with algal growth correction prorated by time; December 10, 1 hour of -0.02 ft algal growth correction between setting SE -0.01 ft and flume cleaning; January 8 - February 4, 2009: 0.00 ft to -0.01 ft algal growth correction prorated by time; February 4 - 24, 2009: -0.01 ft algal growth correction; June 9 - August 14, 2009: 0.00 ft to -0.04 ft algal growth correction prorated by time; August 14 -September 30, 2009: -0.04 ft algal growth correction.

Datum Corrections.-- Levels were last run on February 27, 2008 which resulted in a -0.01 foot correction to the primary reference. The correction was made in lieu of regular maintenance required to the primary reference gage.

Rating.-- The control is a 15-foot Parshall flume with two overflow bays flanking the flume. Rating No. 10 in use since October 1, 1997 is a standard 15-foot Parshall rating up to 5.00 feet of stage. Above 5.00 feet the rating is customized to account for water flowing over the overflow bays. The rating is defined to about 990 cfs by measurements made in 1997. Thirteen measurements (Nos. 186-198) were made this year ranging in discharge from 19 to 156 cfs. Measurement Nos. 190, 191, 195-198 were stage adjusted to account for algal growth and instrumentation corrections. The peak discharge of 483 cfs occurred at 2230 on June 26, 2009 at a stage of 3.77 ft (gage height correction of -0.01 ft applied) with a shift of 0.00 ft. It exceeded measurement No. 198 by 1.92 feet in stage.

Discharge.-- The rating was directly applied to corrected gage-height values to compute the discharge record. All shifts were adjusted to the rating as per agreement with the USBR, Water Commissioner and CDWR. Unadjusted shifts ranged from +0.02 to -0.02 feet. Measurements Nos. 186, 189-193, 195 and 196 were adjusted up to 4% to 0.00 ft shift.

Special Computations.-- The SDR log was manually edited for Day Light Savings (DLS) time adjustments. Time adjustments were made to the SDR instrument however the adjustments were made several days following the prescribed change; thereby, requiring manual adjustment of logged time and stage values in the intervening days until the instrument was physically adjusted.

Remarks.-- The record is good. The rating well defines the range in flow experienced this year. No notations or indications of ice affect were present in the analysis of this record. Station maintained and record developed by Russell V. Stroud .

Recommendations.-- Fabrication of the necessary brackets and fasteners to properly and securely mount the Ha staff section should be undertaken. Semi permanent installation of a clothesline style cableway for Acoustic Doppler Current Profiler (ADCP) use should be considered. Continued moderate to high flow measurements opportunities should be watched for and performed with the ADCP unit. Cleanout of the stilling basin upstream of the flume's converging section should be requested (USBR). Exercising the inlet valves should be done following the winter period.

STATE OF COLORADO
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06735500 BIG THOMPSON RIVER BELOW LAKE ESTES

RATING TABLE--

BTBLESSCO10 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

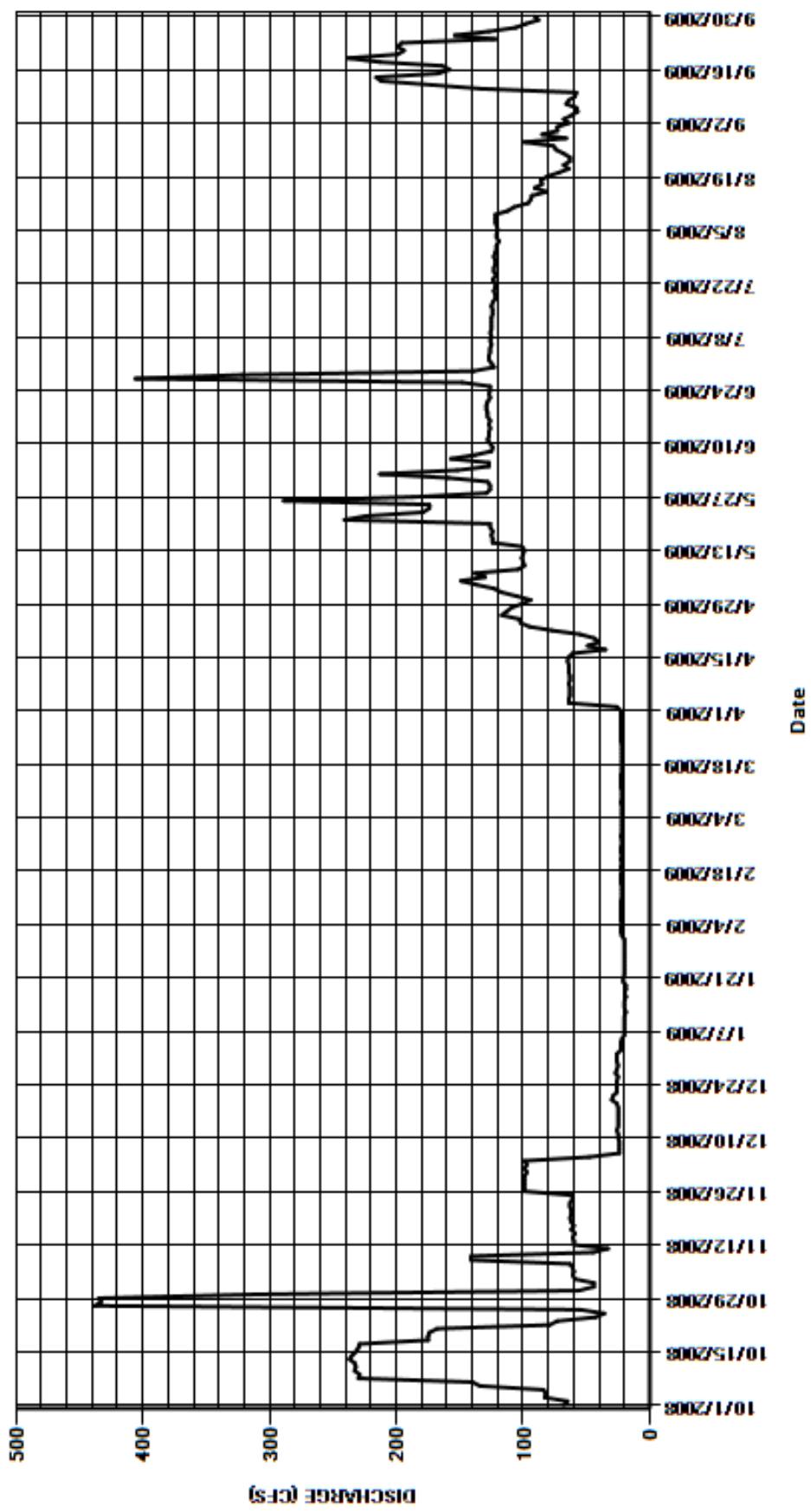
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	68	44	97	26	22	22	23	105	159	125	121	73
2	65	44	99	23	23	22	26	117	213	127	119	64
3	83	59	97	23	23	22	64	123	152	127	121	68
4	82	61	99	23	22	22	64	137	127	126	121	62
5	84	60	48	22	23	22	63	149	127	126	120	57
6	134	61	24	20	23	22	63	130	157	125	121	58
7	140	63	24	20	23	22	63	138	138	126	122	66
8	230	141	24	20	23	23	64	104	125	125	122	64
9	229	141	24	20	23	22	63	99	124	126	122	59
10	233	45	25	20	23	22	63	100	126	125	112	58
11	232	33	25	20	22	22	64	101	128	125	107	133
12	233	60	26	19	22	23	64	100	127	125	96	172
13	237	60	25	20	22	23	64	99	127	125	94	212
14	235	61	25	20	22	23	65	101	126	124	93	216
15	232	59	25	20	23	23	64	124	127	124	81	167
16	230	62	25	19	23	22	61	124	126	125	91	158
17	229	60	25	20	23	22	35	125	128	124	85	164
18	175	62	25	19	22	22	49	124	128	122	86	213
19	175	63	26	19	23	22	40	126	129	122	81	238
20	174	62	30	21	22	22	44	126	129	123	72	199
21	168	62	29	21	23	22	55	241	128	122	64	194
22	79	63	26	20	22	22	77	224	126	122	68	199
23	73	63	26	20	23	22	95	179	127	124	63	196
24	43	61	26	20	23	23	102	174	126	121	63	122
25	36	61	26	20	22	23	103	174	126	123	68	154
26	55	99	25	20	22	23	117	289	148	123	74	127
27	438	99	27	20	23	23	113	187	406	122	76	106
28	433	99	26	20	22	23	109	129	322	122	99	98
29	435	99	25	20	---	23	101	126	139	123	66	88
30	310	99	26	20	---	23	94	126	123	122	85	91
31	56	---	26	20	---	23	---	128	---	121	73	---
TOTAL	5626	2106	1106	635	632	695	2072	4329	4494	3842	2886	3876
MEAN	181	70.2	35.7	20.5	22.6	22.4	69.1	140	150	124	93.1	129
AC-FT	11160	4180	2190	1260	1250	1380	4110	8590	8910	7620	5720	7690
MAX	438	141	99	26	23	23	117	289	406	127	122	238
MIN	36	33	24	19	22	22	23	99	123	121	63	57

CAL YR	2008	TOTAL	57423	MEAN	157	MAX	650	MIN	19	AC-FT	113900
WTR YR	2009	TOTAL	32299	MEAN	88.5	MAX	438	MIN	19	AC-FT	64070

MAX DISCH: 483 CFS AT 22:30 ON Jun. 26,2009 GH 3.77 FT. SHIFT 0 FT. (GH CORR. OF -0.01 FT APPLIED)
 MAX GH: 3.77 FT. AT 22:30 ON Jun. 26,2009 (GH CORR. OF -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)
Water Year 2009

Location.--	Lat. 40°22'30", Long. 105°29'13", in SE 1/4 NW 1/4 sec. 29, T.5 N., R.72 W., Larimer County, Hydrologic Unit 10190006, at tunnel entrance at south end of Olympus Dam on Lake Estes, 1.9 mi east of Estes Park.
Drainage and Period of Record.--	N/A.
Equipment.--	Design Analysis H-334 incremental shaft encoder (SE) directly connected to a high data rate Sutron 8210 Data Collection Platform (DCP) and a standalone Sutron Stage Discharge Recorder (SDR) in a 4-foot by 4-foot concrete shelter at a 15.2-foot wide rectangular concrete canal section. A Sontek Argonaut SW Acoustic Doppler Velocity Meter (ADVM) is placed in the center of the canal approximately 20-feet upstream from the shelter. The primary reference is an Electric Tape Gage (ETG) located in the shelter with a supplemental staff gage located on the left wing-wall of the canal. The gage is operated in cooperation of the Colorado Division of Water Resources (DWR) and the United States Bureau of Reclamation (USBR) as part of the Colorado-Big Thompson (C-BT) Project.
Hydrographic Conditions.--	Controlled release from Olympus dam. Olympus Tunnel conveys water from Olympus Dam (Lake Estes) to Pinewood and Flatiron Reservoirs and is used to generate power at the Pole Hill and Flatiron hydroelectric power plants. Waters entering Flatiron Reservoir from Olympus Tunnel can then be: conveyed to terminal storage at Horsetooth Reservoir via the Charles Hansen Feeder Canal; or, used for power generation at the Big Thompson Power Plant located along the Charles Hansen Feeder Canal system and then delivered to the Big Thompson River; or, directly delivered to the Big Thompson River via The Charles Hansen Feeder Canal Wasteway (HFCWASCO) facility; or, pumped to Carter Reservoir for either terminal storage in Carter Reservoir and/or distribution through the Saint Vrain Supply Canal where direct delivery to the Saint Vrain Creek can be made; or, terminal storage in Boulder Reservoir via the Boulder Feeder Canal (BFCLYOCO) system.
Gage-Height Record.--	The primary record is hourly averages of 15-minute logged SDR data with telemetered data as backup. The record is complete and reliable. Data validation between the two instruments was generally good (within +/- 0.02-feet) with exception of: October 27-November 12, 2008*; December 9-23, 2008*; July 1-10, 2009*. All other significant (> +/- 0.02 feet) variances were determined to be caused by either: errors in the telemetered SE data log; or were encountered on days where a significant stage change occurred. USBR operations cause many significant stage changes to be made at midnight which at times causes the logged midnight value (often the daily maximum or daily minimum) to be logged on a different day. This is postulated to be due to interval timing, clock calibration differences and/or difference in measurement processing times between the two instruments. Whenever this was encountered the primary data set was altered to reflect which ever showed the greater level of magnitude (larger daily maximum or lower daily minimum). *The Design Analysis H-334 (SE) instrument suffered several significant failures this year (October 27, 2008, December 9, 2008, and July 1, 2009) where significant changes in stage caused the encoder tape to slip on the pulley cog rendering the instrument out of calibration. Each event resulted in a different magnitude of correction required to the instrument. Frequent visits by USBR and DWR staff demonstrated good calibration and agreement between both instruments and the base gage throughout the water year with exception to the three periods listed above. One instrumentation correction of 0.01 feet was made on December 23, 2008 (18:00) as indicated by the SDR's Event log. This instrument correction was discounted and not considered in this record process. The correction was discounted in lieu of site visits made prior to the correction showing that the instrument was calibrated correctly. The calibration of 12/23/2008 was made during a period of changing stage. It is assumed that the instrument calibration correction of December 23, 2008 was less than 0.01 feet in total magnitude and therefore no significant change would occur to the record. Zero flow was observed on November 12, 2008 (15:50). C-BT water order No. 09-27 indicated that diversions through the tunnel were discontinued on October 27, 2008. Peak stage of 8.19 feet was recorded by the SDR on December 17, 2008 (20:00). Stage validation with the SE could not be made due to the instrument's tape slipping the pulley cog on December 9, 2008. However, site visits made on December 15, 2008 and December 23, 2008 showed that the SDR instrument was calibrated correctly.
Datum Corrections.--	Levels were last run on November 2, 2006 to verify the installation of a new electric tape gage installed on March 23, 2006. No correction was needed.
Rating.--	The control is a rectangular concrete canal section. Rating No. 7 in use since October 2005 was continued again this year. Rating No. 7 was created using Rating No. 6 (defined by measurements) up to about 4.30 feet of stage and 272 cfs. Above this point Rating No. 7 is not based on measurements, but instead is based on USBR estimates of flow released into Olympus Tunnel. These estimates assume that the Adams tunnel gage is working properly (see ADATUNCO for more details). Rating No. 7 is a temporary solution until more resolution of discrepancies can be fully documented. Olympus Tunnel does not present a typical velocity distribution and as such conventional measurement techniques are not reliable. On March 27, 2008 an ADVM was installed in the center section of Olympus Tunnel approximately 20-feet upstream from the gage shelter. The ADVM was placed in cooperation of DWR and USBR to help resolve issues associated with Rating No. 7. A velocity index rating is in the process of being developed consisting of vertically integrated current meter measurements throughout the full operational range. Current meter measurements of this type require a tremendous amount of time to perform and opportunities to perform these measurements at targeted stages are limited due to current operational practices of the tunnel. Thus, a velocity index rating may take some time to fully define and refine. Records computed using Rating No. 7 should be considered fair henceforth until such time that a comparison can be made between conventionally computed discharge values and ADVM computations. Only one conventional discharge measurement was made this year (No. 468) at 0.83 feet of stage and 22.4 cfs. Peak flow of 571 cfs occurred at 2000 on December 17, 2008 at a stage of 8.19 ft with a shift of 0.00 ft. It exceeded measurement No. 468 made this water year by 7.36 feet in stage.
Discharge.--	Until completion of the velocity indexed rating process the rating is applied directly to the gage-height data if all conventional discharge measurements are within 5% of the rating. Zero flow is determined operationally.

Special Computations.-- The SDR log was manually edited for Day Light Savings (DLS) time adjustments. Time adjustments were made to the SDR instrument however the adjustments were made several days following the prescribed change; thereby, requiring manual adjustment of logged time and stage values in the intervening days until the instrument was physically adjusted.

Remarks.-- The record is fair. Station maintained and record developed by Russell V. Stroud.

Recommendations.-- Vertically Integrated current meter measurements need to be made at targeted stages for development of a velocity indexed rating. Every effort should be made to perform these measurements and develop the rating in an expeditious manner, requiring close coordination with USBR Water Scheduling staff.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)

RATING TABLE--

OLYTUNCO07 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

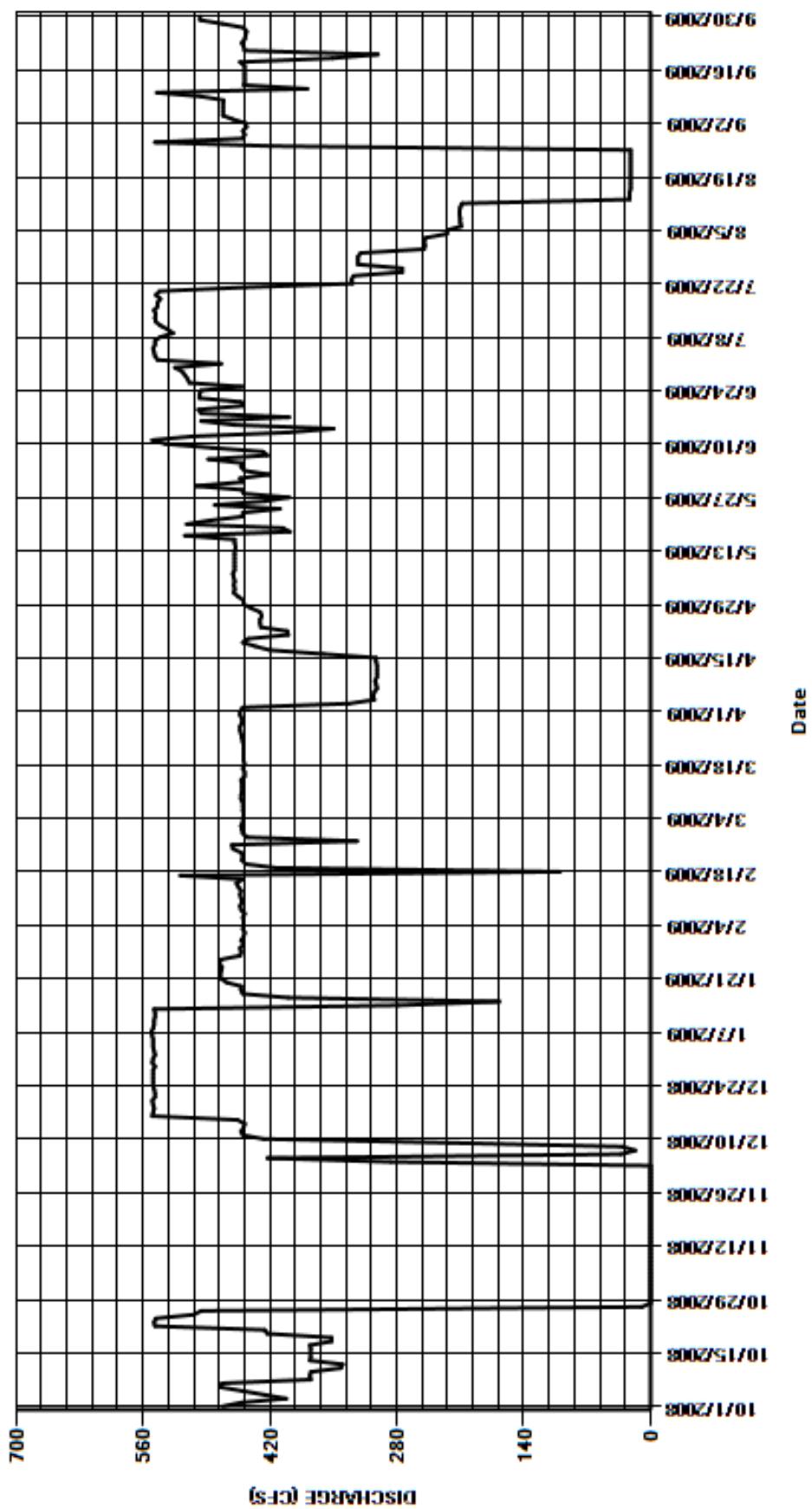
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	472	0	0	547	449	451	453	455	453	474	249	446
2	451	0	0	548	448	452	450	460	421	544	250	447
3	402	0	0	549	450	450	333	459	448	547	248	461
4	426	0	287	549	449	450	305	460	452	548	225	472
5	450	0	423	549	449	449	306	459	451	549	224	472
6	475	0	33	550	450	450	305	460	488	547	209	472
7	473	0	17	551	448	450	302	461	423	547	210	472
8	375	0	31	549	452	450	303	459	428	541	210	471
9	376	0	223	548	453	452	304	459	484	527	211	496
10	375	0	427	548	451	452	302	459	535	533	211	545
11	342	0	450	547	452	451	302	459	550	541	210	379
12	340	0	452	547	453	451	302	459	505	546	208	449
13	376	0	449	548	452	451	302	459	400	547	23	448
14	375	0	448	278	455	452	303	458	350	546	23	448
15	375	0	456	167	457	448	303	459	460	548	23	448
16	375	0	550	400	450	448	361	459	496	544	22	448
17	376	0	549	450	519	450	420	514	399	544	22	448
18	352	0	548	452	100	448	436	398	496	541	22	453
19	352	0	549	452	414	449	450	406	499	546	22	351
20	423	0	550	468	447	449	444	512	449	542	22	301
21	426	0	547	474	451	449	400	485	452	448	22	448
22	547	0	547	475	450	449	401	450	498	329	22	449
23	548	0	548	474	452	449	430	450	498	330	22	451
24	546	0	549	473	461	450	431	409	496	328	22	448
25	504	0	549	476	462	451	431	481	451	274	22	447
26	496	0	549	474	324	452	429	426	509	274	22	446
27	9.8	0	549	453	445	453	431	399	511	323	419	449
28	0	0	549	452	450	453	441	449	514	323	547	472
29	0	0	547	453	---	451	449	451	517	323	450	497
30	0	0	550	449	---	451	449	502	525	320	448	497
31	0	---	549	452	---	453	---	451	---	250	450	---
TOTAL	11037.80	0.00	12475.00	14902	12193	13964	11278	14127	14158	14324	5290	13531
MEAN	356	0	402	481	435	450	376	456	472	462	171	451
AC-FT	21890	0	24740	29560	24180	27700	22370	28020	28080	28410	10490	26840
MAX	548	0	550	551	519	453	453	514	550	549	547	545
MIN	0	0	0	167	100	448	302	398	350	250	22	301
CAL YR	2008	TOTAL	131198.80	MEAN	358	MAX	551	MIN	0	AC-FT	260200	
WTR YR	2009	TOTAL	137279.80	MEAN	376	MAX	551	MIN	0	AC-FT	272300	

MAX DISCH: 571 CFS AT 20:00 ON Dec. 17,2008 GH 8.19 FT. SHIFT 0 FT.

MAX GH: 8.19 FT. AT 20:00 ON Dec. 17,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE
Water Year 2009

Location.--	Lat. 40°20'45", Long. 105°26'30", NW 1/4 sec. 3, T.5 N., R.71 W., Larimer County, 400 ft upstream from mouth at Drake, Co. on U. S. Highway 34 to Estes Park, Co.
Drainage and Period of Record.--	85.1 mi ² . 1947 to present.
Equipment.--	Digital incremental Sutron 8500 shaft encoder connected to a Sutron SatLink Satellite Monitoring Data Collection Platform (DCP) transmitting hourly, and a graphical chart recorder in a 42-inch Corrugated Metal Pipe (CMP) shelter and stilling well. The stilling well is connected to the stream via two 2-inch inlets equipped with gate valves, street keys and a flushing tank (exterior). An Electric Tape Gage (ETG) located on the instrument shelf is the primary reference with a supplemental cantilever chain gage located 10-feet upstream of the shelter.
Hydrographic Conditions.--	Drainage area consists of mainly forested lands and canyons. The town of Glen Heaven, other private residential properties and a state highway are built along the side of much of the north fork channel.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute data with chart record as backup. The record is complete and reliable, except as follows: November 16-17, 20-23, 2008: Gage was ice affected; November 24-26, 2008: Stage data unreliable due to ice ; November 26, 2008 – February 23, 2009: Gage was off for winter and no stage data were collected; February 28, March 1, 8-16, 25-31, April 1-6, 2009: Gage was ice affected; May 27 – June 1, 2009: Gage's inlets were either sluggish or plugged, and stage data are unreliable. With exception to the June 1, 2009 flush correction of +0.25 feet; three minor flush corrections were made throughout the summer months. All three corrections were applied as datum corrections from an earlier change in stage slope. Debris accumulation (leaf detritus) on the control is an issue during the fall periods. Two debris removal corrections were made on: October, 29, 2008 and November 6, 2008. The debris removal corrections were applied as datum corrections prorated by time as follows: October 1, 2008 at 1500, no correction to October 29, 2008 at 1000, -0.01 foot correction. November 6, 2008 at 1300, no correction to November 18, 2008 at 1400, -0.01 foot correction.
Datum Corrections.--	Levels run on October 31, 2008 to establish reference mark (RM) Nos. 5-8 using the ETG as the base reference at an elevation of 11.520 feet (measured tape length). Levels were run again on October 15, 2009 to verify RM establishment. No corrections were required to the primary reference nor RM elevation assignments.
Rating.--	The control for low to moderate stages is a low head concrete dam located approximately 8-feet downstream of the shelter. The control is the channel and brush-lined stream banks at higher stages. As there is little freeboard in this channel the controlling feature for flood level stages has not been determined. The gage's inlets are placed close to the controlling feature, in the draw-down zone for this control. This phenomenon can be seen by deviation in stage readings obtained from the ETG vs. those obtained from the cantilever gage located further upstream. The rating (BTNFDRCO11) has been developed empirically and compensates for draw-down zonal condition. Rating No. 11 in use since October 1, 2002 was continued again this year. Rating No. 11 is defined by measurement from the Point of Zero FLOW (PZF) occurring at 3.40 feet of stage to 232 cfs at 4.73 feet of stage. Twenty-one measurements (Nos. 306-326) were made this year ranging in discharge from 3.85 cfs to 78.9 cfs. The peak flow of 94.2 cfs occurred at 1015 on June 2, 2009 at a stage of 4.36 feet with a shift of 0.00 ft. It exceeded Measurement No.318 made the following day by 0.06 feet in stage. Two visits were made to the gage; one the day prior to the peak and on the day following the peak. Both visits encountered flush correction of differing magnitude. The visit made on June 1, 2009 resulted in a flush correction of +0.25 feet whereas the visit made on June 3, 2009 resulted in a flush correction of -0.02 feet. It is the opinion of the author that because of the visits made to the gage surrounding the peak, the peak should be considered good.
Discharge.--	Shifting section control method used all year. Time prorated shifting was used all year except for the winter period listed above. Moss and debris accumulation is generally not an issue. Substantial scour and fill conditions don't occur within the flow levels experienced this year. Unadjusted shifts ranged from -0.02 feet to +0.02 feet. All measurements were given full weight except as follows: Msmt. Nos. 306, 314, 317,321, 322, 326 were discounted from -5% to +3% to smooth shift distribution.
Special Computations.--	Discharge values for the ice affected periods (November 16-17, 20-26, 2008, February 28-March 1, March 8-16, 25 – April 6, 2009) were estimated from adjacent periods of good record, discharge measurements made near or in the ice affected periods and National Weather Service (Estes Park) temperature data as well as logged temperature data from the Big Thompson Above Lake Estes at Estes Park, CO (BTABESCO) gage upstream from BTNFDRCO gage. Similarly, discharge values for the winter period (November 26, 2008 through February 23, 2009) were estimated from five discharge measurements (Nos. 309-313) made during the period as well as temperature data logged at the (BTABESCO) gage (worksheets enclosed). Discharge values for the May 26 through July 1, 2009 period were estimated from mass balance computations and correlated to hydrograph trends recorded by the BTABESCO gage (worksheet enclosed).
Remarks.--	The record is good, except for periods ice effect, no gage height record and unreliable gage height record due to partially plugged inlets, which are estimated and poor. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	Levels should be run concluding the 2010 water year to verify gage stability, Reference Point (RP) elevation, RM assignments and PZF elevation. Efforts to define the upper portions of the rating should be continued. Installation of a bank operated cableway should be considered to help define the upper portion of the rating when available.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE

RATING TABLE--

BTNFDRCO11 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

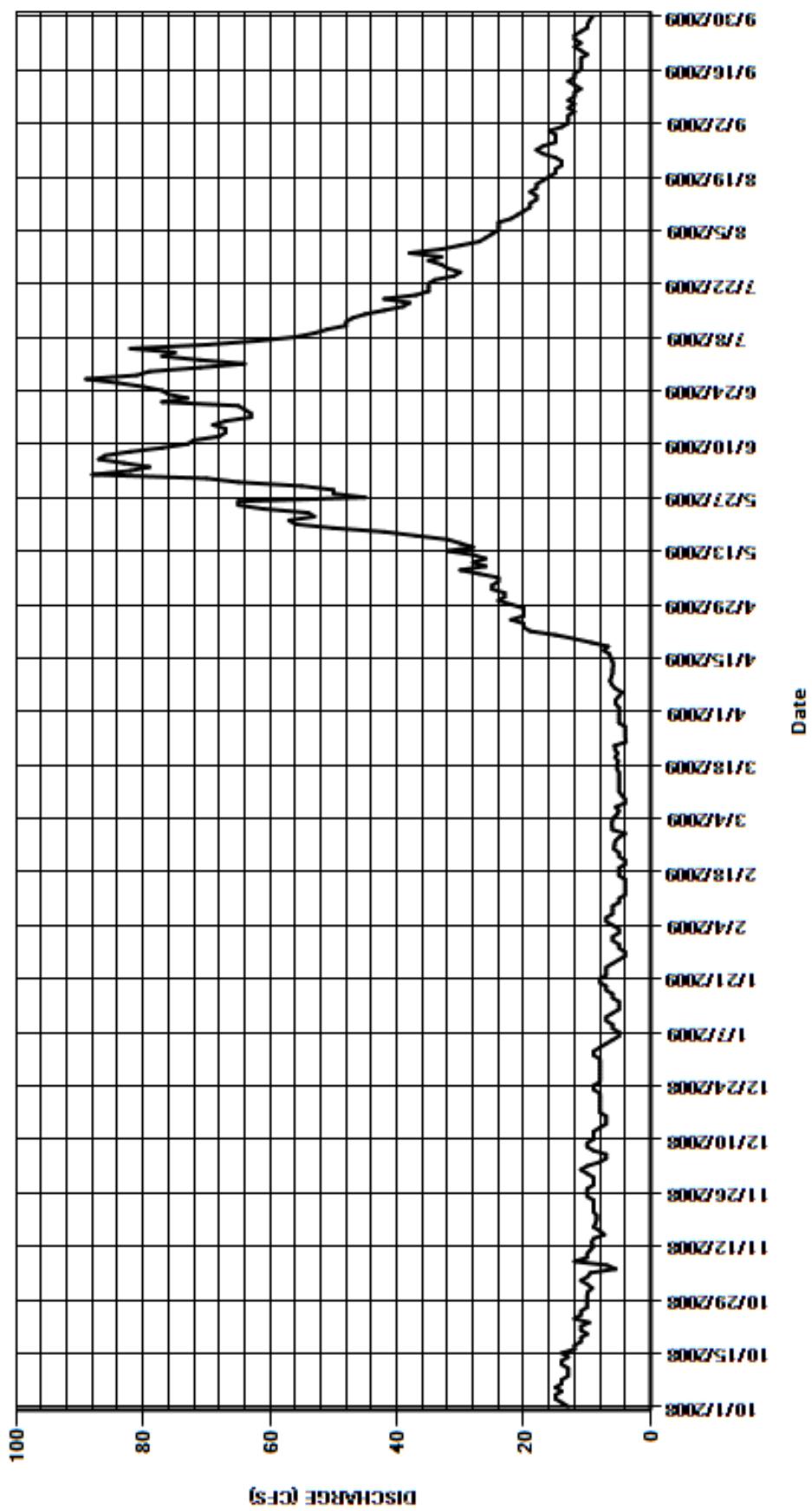
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	9.2	10	9	6	6	5	23	70	64	30	14
2	14	10	11	9	5	6.1	5	23	88	71	27	13
3	15	11	10	8	5	6.1	5.5	25	82	77	26	13
4	15	9.9	8	7	6	5.9	5.5	25	79	75	25	13
5	14	9.5	7	6	7	5.3	5	24	83	82	24	12
6	15	5.5	7	5	7	5	4.5	24	87	70	24	13
7	14	6.9	9	5	6	5.5	5.6	27	86	62	24	12
8	14	12	10	6	6	4	6.1	30	82	56	22	13
9	13	10	10	6	6	4	6.4	26	77	53	21	12
10	13	10	9	7	5	4.5	6.2	28	73	51	20	12
11	13	9.5	9	7	5	5	6	26	72	48	19	11
12	14	9	9	6	4	5	6	28	68	48	19	12
13	14	9.3	8	5	4	5	5.9	32	67	47	18	13
14	13	9	7	5	4	5	6	28	67	45	18	12
15	14	7.3	7	5	4	5	6.3	30	69	42	19	12
16	12	8	7	6	4	5	6.5	32	67	39	18	11
17	12	9	8	6	5	5.3	7.4	37	63	38	18	11
18	11	8.7	8	7	5	5.3	6.7	42	63	42	17	11
19	11	8.5	8	7	5	5.1	9.3	50	64	37	16	11
20	10	8.5	8	8	4	5.6	12	56	65	35	15	10
21	11	9	8	8	4	5.2	15	57	77	35	15	11
22	11	9	8	7	5	5.6	19	53	73	35	14	12
23	9.7	9	9	7	5	5.7	20	54	76	34	14	11
24	12	9	9	7	5.8	3.9	20	61	77	31	15	12
25	11	10	8	6	5.7	4	22	65	80	30	17	12
26	11	10	8	5	5.6	4	20	65	84	32	18	11
27	10	10	8	4	5	4	20	45	89	33	17	10
28	10	9	8	4	4	4	20	50	81	35	15	9.9
29	10	9	8	5	---	5	22	50	79	33	15	9.6
30	10	9	8	5	---	5	24	55	71	38	15	9.1
31	9.9	---	8	6	---	5	---	65	---	33	16	---
TOTAL	379.6	273.8	260.0	194.0	143.1	155.1	328.9	1236	2259	1451	591	348.6
MEAN	12.2	9.13	8.39	6.26	5.11	5	11	39.9	75.3	46.8	19.1	11.6
AC-FT	753	543	516	385	284	308	652	2450	4480	2880	1170	691
MAX	15	12	11	9	7	6.1	24	65	89	82	30	14
MIN	9.7	5.5	7	4	4	3.9	4.5	23	63	30	14	9.1
CAL YR	2008	TOTAL	8633.3	MEAN	23.6	MAX	133	MIN	5	AC-FT	17120	
WTR YR	2009	TOTAL	7620.1	MEAN	20.9	MAX	89	MIN	3.9	AC-FT	15110	

MAX DISCH: 94 CFS AT 10:15 ON Jun. 02,2009 GH 4.36 FT. SHIFT 0 FT.

MAX GH: 4.36 FT. AT 10:15 ON Jun. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06736000 NORTHFORK BIG THOMPSON RIVER AT DRAKE
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
DILLE TUNNEL NEAR DRAKE
Water Year 2009

Location.--	Lat. 40°25'10", Long. 105°14'45", NW 1/4 NW 1/4 sec. 9, T.5 N., R.70 W., Larimer County. Diverts water from Big Thompson River and Transmountain diversions from Colorado River basin to Hansen Feeder Canal.
Drainage and Period of Record.--	N/A.
Equipment.--	Digital incremental Sutron 56-0540 shaft encoder connected to a Sutron SatLink Data Collection Platform (DCP) transmitting hourly in a rectangular concrete shelter with a concrete Ha stilling well at a 8-foot Parshall flume. Gage is equipped with electric tape gage (ETG) as the primary reference. There is no supplementary staff gage as the flume is located in a tunnel and cannot be observed when in operation. The gage is operated in cooperation with the United States Bureau of Reclamation (USBR), Northern Colorado Water Conservancy District (NCWCD) and the Colorado Division of Water Resources (DWR) as a component of the Colorado-Big Thompson (C-BT) system.
Hydrographic Conditions.--	Controlled diversion. Flow is regulated by a check structure and radial gate diverting water from the Big Thompson River, conveying it to the Charles Hansen Feeder Canal several miles downstream. Water diverted via this structure can be either conveyed to terminal storage at Horsetooth Reservoir or delivered back to the Big Thompson River through the Big Thompson Power Plant (BTPPMCO) or via the Charles Hansen Feeder Canal Wasteway (HFCWASCO) structures. A large stilling basin and energy control devices are located downstream from the radial gates and upstream from the flume's converging section.
Gage-Height Record.--	The primary record is hourly averages of 15-minute gage-height data taken from the DCP, with logged SDR data as back up. Frequent visits by NCWCD, USBR and DWR staff showed good and consistent agreement between sensors and primary reference throughout the year. The record is complete and reliable. No corrections were necessary nor made to the shaft encoder. Three corrections were made to the SDR, two of which were made following reinstitution of diversions into the tunnel. The structure is generally not operated in winter months; however, a thermostatically control submersible stock tank heater has been placed in the stilling well in the event that this structure were to be operated in the winter.
Datum Corrections.--	Levels were last run on October 9, 2007.
Rating.--	The control is an 8-foot Parshall Flume. From 1996 to 2005, a version of a standard Parshall rating table (DILTUNCO03) was used. DILTUNCO03 was expanded by tenths of a foot above a gage-height of 1.00 ft resulting in slight rounding errors when compared to a fully expanded 8 foot Parshall rating table. Thus, rating table STD08FTPF (defined from 0.00 to 4.00 feet) or a variant thereof has been used since 2006. STD08FTPFEXP is a standard 8 foot Parshall flume rating expanded formulaically to 5 feet of stage using standard 8 foot Parshall flume formula to cover stages in excess of 4.00 ft. The gage was measured infrequently due to considerable safety hazards. More recently as per USBR Hazardous Energy Entry policies the structure has not been measured as the measurement structure cannot be entered when water is actively being diverted. Measurement opportunities are limited at the tunnel's east portal, due to backwater from Hansen Feeder Canal and performing measurements upstream of the tunnel diversion is not possible due to swift water conditions and excessive depth issues. Mass balance computations now are used to track this structure's performance. The most recent measurement (No. 110) made in the 2004 water year had a zero shift. Similarly, previous years' measurements have all fallen within 5% of the standard table and were adjusted to zero as per agreement with the Water Commissioner, USBR, NCWCD and DWR. For the purposes of this record the rating has been altered to account for the inlet being 0.09 feet above the crest elevation. Discharges for stages of 0.09 feet and below were set to zero. Peak flow of 412 cfs occurred at 2045 on October 27, 2008 at a gage height of 4.91 feet with a shift of 0.00 ft..
Discharge.--	The rating was applied directly to the gage height record to compute the discharge record. Zero shifting was used for the entire water year, in agreement with the USBR, NCWCD and DWR and is supported by mass balance calculations made in the 2009 water year. Discharge values recorded between April 17 (08:00) and April 23, 2009 (07:00) do not represent active diversion of water into the tunnel. Rather, this was determined to be an incidental diversion and was not recorded by the USBR as an intended diversion. Mass balance computations made throughout the water year as well as in the evaluation of this record show good agreement with computed diversions made by this structure.
Special Computations.--	The shaft encoder and SDR do not completely go to zero when the tunnel is not in use. Levels and flume inspection on October 9, 2007 found the inlet invert approximately 0.09 feet above the flume floor and crest. This observation is consistent with notations of positive stage readings occurring at zero flow as well as previous year's point of zero flow (PZF) stage assumptions. Diversion of water at this stage generally does not occur in this stage range; therefore the consequence of this occurrence is minimal and only needs to be considered on "startup" and "shutdown" days. The rating table used for discharge computation has been edited to zero all discharge values at and below 0.09 feet of stage.
Remarks.--	Record is good. Flow at this station is intermittent dependent on river flows, C-BT water orders, and other regulations. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	

STATE OF COLORADO
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DILLE TUNNEL NEAR DRAKE

RATING TABLE--

STD8FTPFFEXP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	75	0	0	0	0	5.3	51	90	62	0
2	0	0	75	0	0	0	0	5.3	70	83	62	0
3	0	18	75	0	0	0	17	5	70	87	73	0
4	0	28	75	0	0	0	34	5.1	109	90	78	0
5	0	28	39	0	0	0	32	5.8	97	91	21	0
6	64	27	0	0	0	0	32	5.6	79	90	52	0
7	81	28	0	0	0	0	31	5.6	76	90	76	0
8	155	83	0	0	0	0	29	49	82	90	74	0
9	182	110	0	0	0	0	28	74	109	90	72	0
10	178	37	0	0	0	0	28	80	118	90	20	0
11	179	0	0	0	0	0	28	80	118	90	0	53
12	179	24	0	0	0	0	28	80	118	91	0	93
13	179	36	0	0	0	0	28	80	103	90	0	128
14	179	33	0	0	0	0	28	80	98	90	0	139
15	179	29	0	0	0	0	28	80	91	90	0	100
16	180	36	0	0	0	0	24	91	88	90	0	85
17	179	33	0	0	0	0	10	95	88	90	0	85
18	137	32	0	0	0	0	2.1	95	88	83	0	52
19	125	31	0	0	0	0	1.9	102	73	80	15	40
20	124	31	0	0	0	0	1.6	63	59	80	13	40
21	124	32	0	0	0	0	1.2	68	55	80	8.1	41
22	53	35	0	0	0	0	0.83	43	55	80	6.8	41
23	29	38	0	0	0	0	3.5	54	55	79	1.8	33
24	8.1	33	0	0	0	0	4.9	64	55	79	0	44
25	0	27	0	0	0	0	3.5	87	56	80	7.2	87
26	0	59	0	0	0	0	2.8	75	56	67	10	41
27	290	76	0	0	0	0	4.2	19	292	62	10	5
28	397	76	0	0	0	0	5.2	31	300	62	10	0
29	391	76	0	0	---	0	5.1	84	144	62	2.8	0
30	298	76	0	0	---	0	5	86	92	62	0	0
31	70	---	0	0	---	0	---	22	---	62	0	---
TOTAL	3960.10	1172.00	339.00	0.00	0.00	0.00	446.83	1719.7	2945	2540	674.70	1107.00
MEAN	128	39.1	10.9	0	0	0	14.9	55.5	98.2	81.9	21.8	36.9
AC-FT	7850	2320	672	0	0	0	886	3410	5840	5040	1340	2200
MAX	397	110	75	0	0	0	34	102	300	91	78	139
MIN	0	0	0	0	0	0	0	5	51	62	0	0

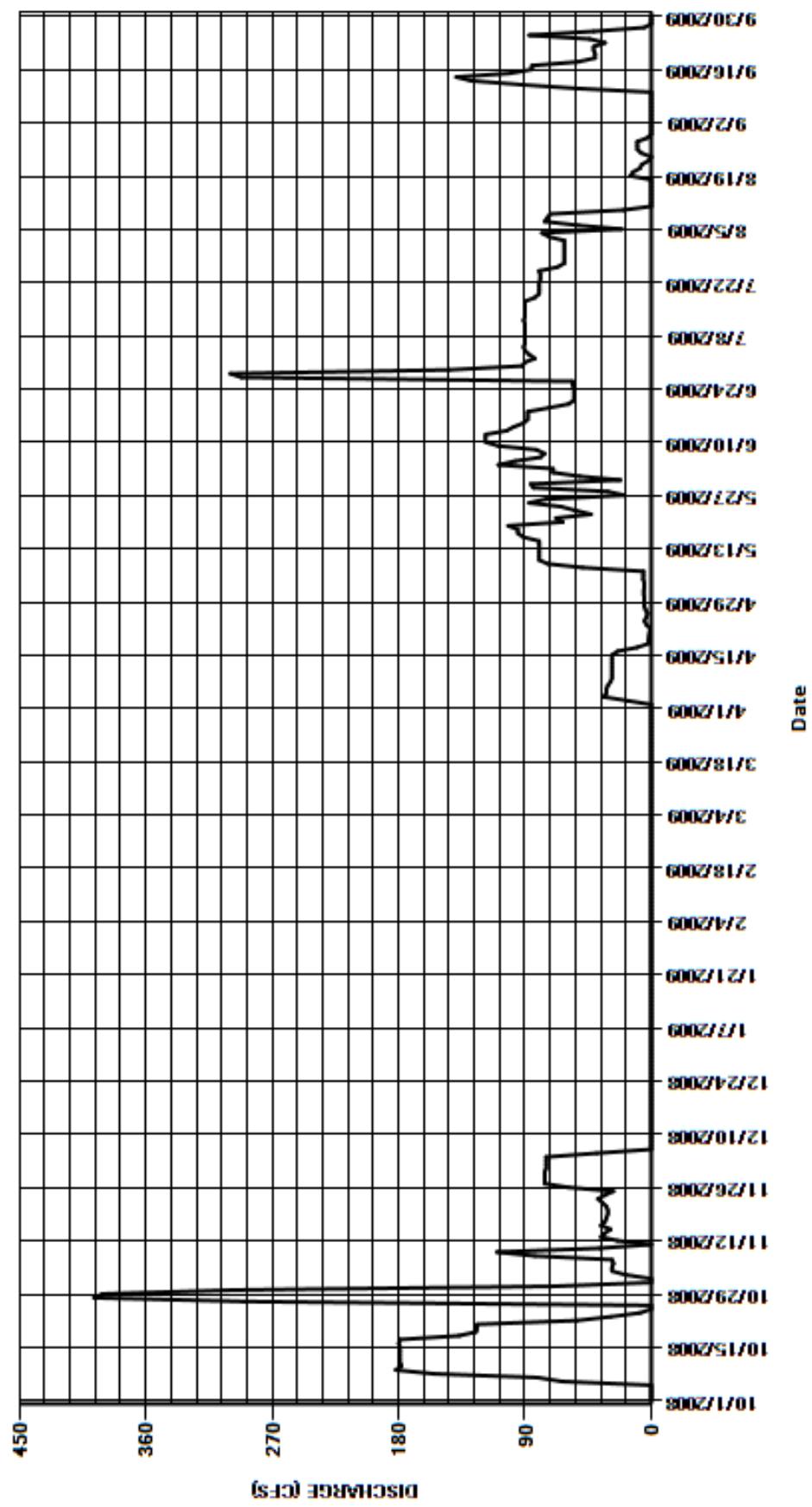
CAL YR	2008	TOTAL	30318.10	MEAN	82.8	MAX	397	MIN	0	AC-FT	60140
WTR YR	2009	TOTAL	14904.33	MEAN	40.8	MAX	397	MIN	0	AC-FT	29560

MAX DISCH: 412 CFS AT 20:45 ON Oct. 27,2008 GH 4.91 FT. SHIFT 0 FT.

MAX GH: 4.91 FT. AT 20:45 ON Oct. 27,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DILLE TUNNEL NEAR DRAKE
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE

Water Year 2009

Location.--	Lat. 40°25'18", Long. 105°13'34", in SW¼SW¼ sec. 3, T,5 N., R.70 W., Larimer County, Hydrologic Unit 10190006, on right bank at mouth of canyon, 400 ft upstream from Handy Ditch diversion dam, and 6.0 mi east of Drake.
Drainage and Period of Record.--	305 mi ² . 1927-1933, 1938 to present.
Equipment.--	A Sutron Constant Flow Bubbler (CFB) in 6-foot by 6-foot pre-cast concrete shelter at a low head concrete dam control. A cantilever style wire weight gage located on the right edge of water near the shelter is the primary reference with no provisions of a supplemental reference. The CFB is connected to the Hansen Feeder Canal Wasteway to the Big Thompson River (HFCWASCO) Data Collection Platform (DCP) via a Design Analysis H-423 SDI-12 to RS-485 converter unit carried by buried copper wire placed by the US Bureau of Reclamation (USBR) between this and the HFCWASCO gages. Additionally, a Design Analysis H-416 (SDI-12 to 4-20mA converter) is also connected to the CFB unit to provide a Supervisory Control and Data Acquisition (SCADA) output to the USBR's control center. An aircraft cable pulley system intended for use with an Acoustic Doppler Current Profiler (ADCP) was installed across the channel perpendicular from the shelter on May 15, 2008 and subsequently removed in October, 2008. The measurement section was determined to be inadequate for ADCP use after attempting numerous ADCP measurements employing several different methods and techniques. This gage is operated and maintained by the Colorado Division of Water Resources (DWR) and is simultaneously used by the DWR, USBR, Northern Colorado Water Conservancy District (NCWCD) and the Home Supply Ditch Company.
Hydrographic Conditions.--	Drainage area consists of widely varying terrain, vegetative types, hardened surfaces and numerous diversions, regulated and unregulated deliveries to the system. Flow patterns are largely regulated by Colorado Big Thompson (C-BT) operations occurring upstream from this gage from Lake Estes to the Dille Tunnel diversion (DILTYNCO).
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute CFB data with the CFB's independent log as backup. The record is complete and reliable, except as follows: November 25, 2008, March 14-15 and 26-29,2009, when the gage was ice affected; November 26, 2008 and March 13, 2009, partial day records corresponding to instrument deactivation and activation days; November 27, 2008 through March 12, 2009, when the gage was closed for winter and no gage-height record available; September 8-12, 2009, when instrumentation was disabled due to damage from a severe lighting storm , and no backup data were available, CFB unit was damaged beyond repair. Several hourly erroneous values were recorded on September 22, 2009 when the instrument was being worked on to restore USBR SCADA telemetry. Gage-height values were interpolated from adjacent good record and primary reference gage readings made while work was being conducted. The peak gage-height of 3.62 feet occurred on June 27, 2009 (05:45). The peak was transient and was caused by a major diversionary change immediately upstream at the DILTYNCO site.
Datum Corrections.--	Levels were run on October 30, 2008 indicating a correction of -0.051 feet to the primary reference. No correction was made at that time. Levels were run again on October 15, 2009 which indicated a correction of -0.044 feet to the primary reference was warranted. Again, no correction was made. Levels are scheduled to be run when the station opens for the season in the 2010 water year. Regardless, a -0.05 ft datum correction was applied to the record for the entire 2009 water year. Levels run over the last several years indicate significant instability in the areas surrounding the gage as well as the control. Continued efforts to substantiate the instability will continue to be taken.
Rating.--	The control is a concrete dam approximately 20 feet below the gage shelter. Rating No. 16 in use since October 1, 2000 was continued this year. It is defined by measurements from 4 to 2100 cfs. Flows up to about 150 cfs can be waded near the gage. However, high flow wading measurements are not possible at this gage due to the steep grade and narrow confines of the channel, lack of a suitable cableway and no possibilities for a bridge measurement. Geographical limitations and the placement of bridges near the gage as well as the numerous diversions and inflows to the channel further compound this inability to measure high flows at or near this gage. Fourteen measurements (No. 320-333) were performed this year ranging in discharge from 26.1 to 156 cfs. The peak discharge of 507 cfs occurred at 0545 on June 27, 2009 at gage height of 3.62 ft (datum correction of -0.05 feet applied) with a shift of 0.01 ft.
Discharge.--	Time prorated shifting was used this year, except for the winter period listed above. Unadjusted shifts ranged from -0.04 to 0.02 feet. All measurements were given full weight. Discharge for the ice affected and winter periods (November 25 and 26, 2008; March 13-15, and 26-29 2009) was estimated from adjacent periods of good record and correlated to a mass balance calculation (BTBLESSCO + BTNFDRCO - DILTYNCO = BTCANYCO). Likewise discharge for the winter period (November 27, 2008 through March 12, 2009) was computed from the mass balance calculation with respect to temperature data logged at the BTCANYCO and Big Thompson above Lake Estes (BTABESCO) gages. Since measurement of sustained high flows is not possible at this gage; flows exceeding 200 percent of the highest measurement of 156 cfs (No. 327) or 312 cfs and above are outside the verifiable range of accuracy. Therefore, flow exceeding 312 cfs such as the peak event are considered fair.
Special Computations.--	Winter measurements are not made at this gage. Rather, estimated winter record was developed via a summation of (BTBLESSCO + BTNFDRCO) minus (-) DILTYNCO. Reasonable agreement is illustrated from the computed BTCANYCO record and actual BTCANYCO record prior to and especially after winter operations.
Remarks.--	The record is good except for periods of ice effect and no gage height record, which are estimated and poor. Sustained high flows above those typically encountered at the BTCANYCO gage this year were partly due to issues within the USBR's Colorado-Big Thompson (C-BT) system. The USBR lost capacity to route water through the Flatiron Reservoir Hydroelectric plant due to one of their turbines suffering a catastrophic failure and rendering it inoperable. Bank inflow into the channel below the control continues to be an issue and is suspected to have increased in the past several years. Water traveling around the gage and control structures may contribute to differences seen in mass balance computations within the Big Thompson Canyon system. Winter estimation is typically correlated to the Home Supply winter diversion values; however, the Water Commissioner was unable to provide diversion data at the time of this evaluation. Station maintained and record developed by Russell V. Stroud.

Recommendations.--

Strict adherence to running levels twice per year is required. The stability of the control, reference points and the Point of Zero Flow (PZF) are questionable and needs to be monitored and substantiated. Inflow immediately below the control needs to be monitored for "piping" of road base material as well as significant changes in discharge. An independent log should be maintained in the gage shelter for observations of inflow turbidity and rate. Measurement of flows in excess of 150 cfs is nearly impossible at this gage. In 2006 the manned cableway was deemed unsafe, condemned and was subsequently removed in 2008. Opportunities to measure in other locations are rare due to diversions and deliveries made to the river and the location / orientation of nearby bridges. Other methods to measure higher flows at or near the gage have been investigated unsuccessfully, including use of ADCP technology. It appears that only two options remain to measure and verify flows at higher stages: Installation of a manned or bank operated cableway near the gage shelter. Indirect measurement downstream of the gage including concurrent measurement of diversions away from and inflows to the river between the gage and the first suitable bridge. Design work for installation of a Bank-Operated Cableway is currently being undertaken with an anticipated installation date of April 1, 2010.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE

RATING TABLE--

BTCANYCO16 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

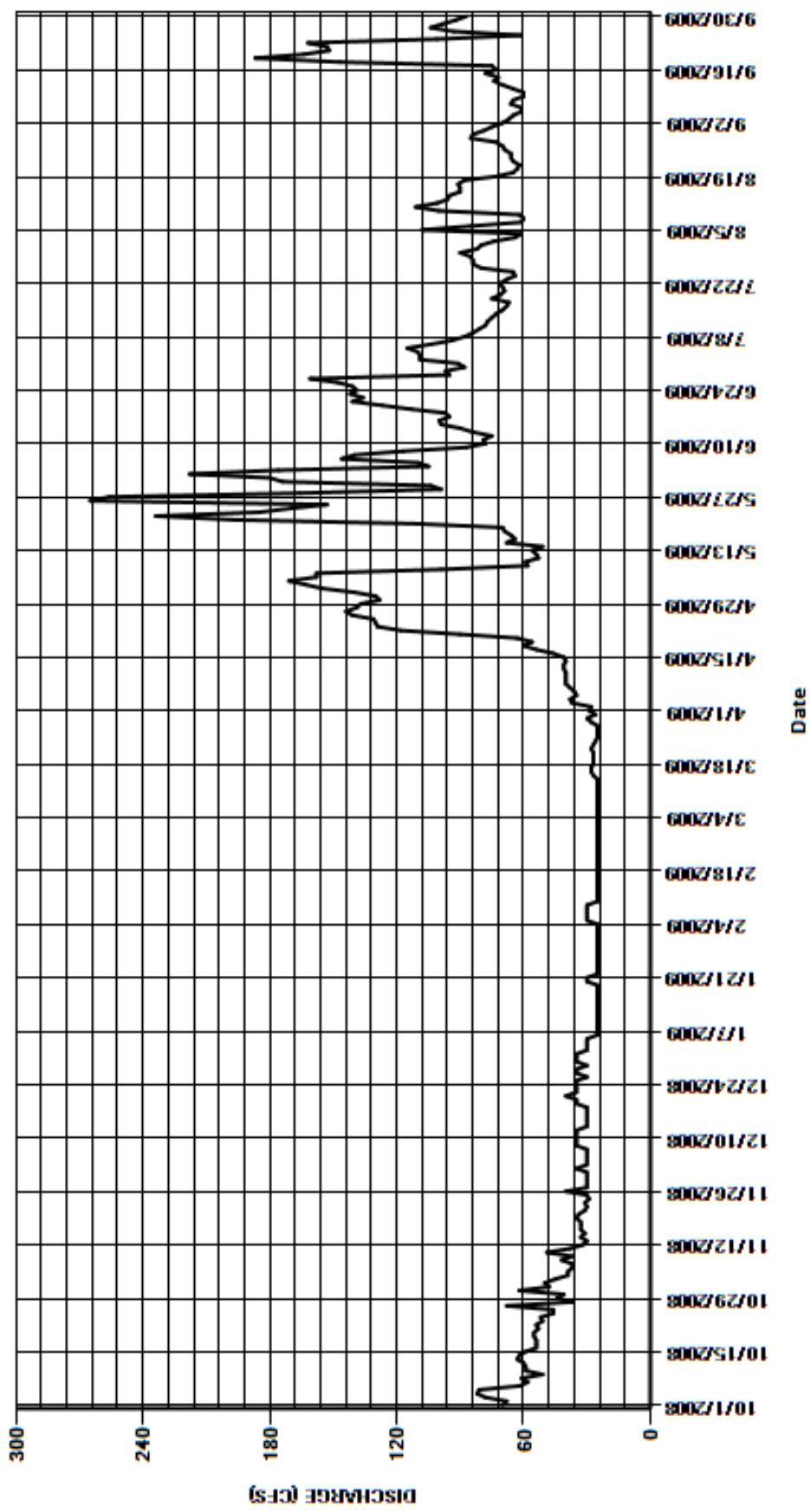
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	70	48	30	35	25	25	29	130	180	91	80	75
2	68	50	35	30	25	25	28	140	218	109	74	70
3	78	45	30	30	25	25	37	155	176	109	64	67
4	82	39	30	30	25	25	38	163	105	110	61	65
5	81	39	30	30	30	25	35	171	110	115	108	61
6	62	37	30	25	30	25	36	158	146	104	85	61
7	58	37	30	25	30	25	38	158	140	94	61	66
8	61	42	35	25	30	25	40	99	117	88	60	65
9	51	37	35	25	30	25	40	58	87	84	62	60
10	59	49	35	25	25	25	40	59	78	81	100	60
11	59	38	35	25	25	25	40	53	79	78	111	65
12	60	32	35	25	25	25	41	54	75	77	101	70
13	63	30	30	25	25	25	41	56	84	75	96	74
14	62	33	30	25	25	25	40	51	90	73	95	72
15	59	31	30	25	25	27	41	68	99	70	90	78
16	54	33	30	25	25	28	46	64	100	68	90	73
17	54	33	30	25	25	28	54	66	95	67	91	75
18	54	33	30	25	25	27	60	69	97	75	88	147
19	55	35	35	25	25	27	56	70	113	71	73	187
20	55	34	35	30	25	27	63	111	127	69	65	164
21	53	31	40	30	25	27	90	197	141	70	63	152
22	54	30	35	25	25	28	118	234	136	71	62	153
23	51	31	35	25	25	27	129	185	142	68	65	162
24	52	29	35	25	25	26	130	170	139	64	66	101
25	46	30	35	25	25	25	131	153	141	65	66	61
26	46	40	30	25	25	25	141	265	148	80	69	93
27	68	30	35	25	25	25	144	256	161	84	70	104
28	37	30	35	25	25	25	139	166	95	84	73	98
29	44	30	30	25	---	28	137	99	97	85	85	92
30	41	30	35	25	---	30	128	104	88	90	84	87
31	62	---	35	25	---	26	---	174	---	82	79	---
TOTAL	1799	1066	1020	815	725	806	2130	3956	3604	2551	2437	2758
MEAN	58	35.5	32.9	26.3	25.9	26	71	128	120	82.3	78.6	91.9
AC-FT	3570	2110	2020	1620	1440	1600	4220	7850	7150	5060	4830	5470
MAX	82	50	40	35	30	30	144	265	218	115	111	187
MIN	37	29	30	25	25	25	28	51	75	64	60	60
CAL YR	2008	TOTAL	35832	MEAN	97.9	MAX	841	MIN	25	AC-FT	71070	
WTR YR	2009	TOTAL	23667	MEAN	64.8	MAX	265	MIN	25	AC-FT	46940	

MAX DISCH: 507 CFS AT 05:45 ON Jun. 27,2009 GH 3.62 FT. SHIFT 0.01 FT. (DATUM CORR. -0.05 FT APPLIED)

MAX GH: 3.62 FT. AT 05:45 ON Jun. 27,2009 (DATUM CORR. -0.05 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06739500 BUCKHORN CREEK NEAR MASONVILLE
Water Year 2009

Location.-- Lat. 40°26'04", Long. 105°10'47", just downstream from Larimer County Road 24H bridge over Buckhorn Creek.

Drainage and Period of Record.-- 140 mi².

Equipment.-- Graphic water stage recorder and Sutron High Data Rate (HDR) Data Collection Platform (DCP) with shaft encoder in a wooden shelter, and a stilling well with an Electric Drop Tape as the primary reference.

Hydrographic Conditions.-- Drainage area consists of low timber and plains drainage, with storm runoff but no high snow. Numerous rural road bridges and culverts span the creek.

Gage-Height Record.-- The primary record is hourly averages of telemetered 15-minute data with chart data as backup. The record is complete and reliable, except for the following days the gage height was affected by ice: December 14-17, 21-25, 27, 2008; January 5, 26-28; 2009. Two calibration corrections and one correction due to cleaning of debris from the control were made.

Datum Corrections.-- Levels were not run this year. Levels were last run in 2000. Gage was found to be reading correctly.

Rating.-- The low water control is a concrete dam with 6-in by 8-in treated lumber bolted to the top of the existing concrete control to help raise the water depth. Rating No. 7, in use from December 27, 1999 was continued in use for the entire 2009 water year. The rating is defined to about 2000 cfs. There appears to be a break in the rating due to the change in control during higher flows. Thirteen measurements (Nos. 615 - 627) were made this water year ranging in discharge from 0.69 to 34.5 cfs. Measurements covered the range experienced this year well, except, several days in October and November were below the lowest measurement of 0.69 cfs. These discharges were only a few hundredth lower than the measurement of 0.69 cfs. Daily discharges above the highest measured discharge of 34.5 cfs are as follows April 25-26, May 4; 2009. The peak flow of 40.5 cfs occurred at 1115 on April 25, 2009 at a gage height of 5.39 ft with a shift of -0.03 ft. It exceeded measurement No. 622 by 0.05 feet of stage.

Discharge.-- Shifting control method was used all year. Shifts were distributed applied by time proration with consideration of stage for the entire year. Unadjusted shifts ranged from -0.04 to -0.02 feet. One measurement (No. 625) was adjusted to smooth shift distribution.

Special Computations.-- Discharges for the ice effected days were interpolated from days of good gage height on both sides of the affected period.

Remarks.-- The record is good, except for the ice affected periods, which are estimated and poor. Station maintained and record developed by Lee Cunning.

Recommendations.-- Outside readings are needed for measurements and visits, so the unreadable outside staff needs to be repaired or replaced. The control needs to be extended to the east where water is going around the timber. A full set of levels need to be run, re-marking all BM's. The description needs to be updated with secondary BM information and photos. A high flow measurement should be made to verify the peaks in this channel.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06739500 BUCKHORN CREEK NEAR MASONVILLE

RATING TABLE--

BUCRMVCO07 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.74	0.68	0.68	0.73	0.99	0.98	1.2	31	20	7.9	4.6	1.2
2	0.72	0.68	0.64	0.83	1	0.96	1.3	30	22	7.7	3.3	1.2
3	0.74	0.75	0.79	0.83	1.1	0.93	1.4	34	34	7.8	2.9	1.1
4	0.74	0.83	0.83	0.83	1.1	0.95	1.6	37	34	8.4	2.7	1.2
5	0.75	0.83	0.85	0.8	1.1	0.98	1.6	34	32	13	2.5	1.2
6	0.74	0.83	0.83	0.83	1.1	0.98	1.6	32	28	15	2.5	1.2
7	0.7	0.83	0.83	0.83	1.1	0.98	1.6	31	24	15	2.3	1.2
8	0.66	0.83	0.86	0.83	1.1	0.98	1.6	29	24	12	2.7	1.3
9	0.68	0.83	0.91	0.81	0.88	0.98	1.6	26	27	9.2	2.6	1.3
10	0.74	0.72	0.89	0.83	0.96	1	1.8	27	30	8.1	2.3	1.3
11	0.96	0.68	0.85	0.83	0.98	0.98	2	26	33	7.4	1.9	1.3
12	1.1	0.68	0.83	0.84	0.98	0.98	2.2	23	33	6.4	1.8	1.4
13	0.94	0.68	0.84	0.89	0.98	0.98	2.3	20	30	5.9	1.6	1.5
14	0.68	0.68	0.85	0.98	0.98	0.98	2.3	20	26	5.5	1.6	1.4
15	0.68	0.68	0.85	0.98	0.94	0.98	2.3	18	23	4.6	1.6	1.3
16	0.65	0.68	0.85	0.98	0.96	0.98	2.8	18	24	3.9	1.5	1.3
17	0.61	0.68	0.85	0.98	0.91	0.98	5.6	19	21	3.5	1.5	1.3
18	0.58	0.68	0.87	0.97	0.94	0.98	9.8	17	19	2.4	1.5	1.3
19	0.53	0.68	0.83	0.98	0.98	0.98	9.8	14	17	2	1.4	1.3
20	0.53	0.68	0.83	0.99	0.94	1	10	14	16	2	1.3	1.4
21	0.62	0.68	0.8	0.98	0.97	1.1	12	13	15	2.2	1.3	1.5
22	0.67	0.68	0.8	0.97	0.98	1	18	13	14	2.3	1.2	1.4
23	0.67	0.68	0.8	0.98	0.98	1.1	22	12	15	2.3	1.2	1.4
24	0.68	0.6	0.8	0.98	0.98	1.1	30	14	13	2.2	1.2	1.4
25	0.68	0.62	0.8	0.98	0.95	1.1	37	18	12	2	1.3	1.4
26	0.68	0.6	0.83	1	0.92	1.2	37	28	12	2.1	1.3	1.3
27	0.69	0.64	0.8	1	0.98	1.1	35	34	14	1.9	1.2	1.2
28	0.77	0.68	0.83	1	0.98	1.2	32	26	12	2	1.2	1.3
29	0.72	0.68	0.82	1.2	---	1.2	33	23	9.8	2.5	1.2	1.3
30	0.71	0.68	0.68	1.1	---	1.2	33	21	8.6	4	1.3	1.2
31	0.74	---	0.71	1	---	1.1	---	20	---	5.1	1.3	---
TOTAL	22.10	21.15	25.23	28.76	27.76	31.94	353.4	722	642.4	176.3	57.8	39.1
MEAN	0.71	0.71	0.81	0.93	0.99	1.03	11.8	23.3	21.4	5.69	1.86	1.3
AC-FT	44	42	50	57	55	63	701	1430	1270	350	115	78
MAX	1.1	0.83	0.91	1.2	1.1	1.2	37	37	34	15	4.6	1.5
MIN	0.53	0.6	0.64	0.73	0.88	0.93	1.2	12	8.6	1.9	1.2	1.1

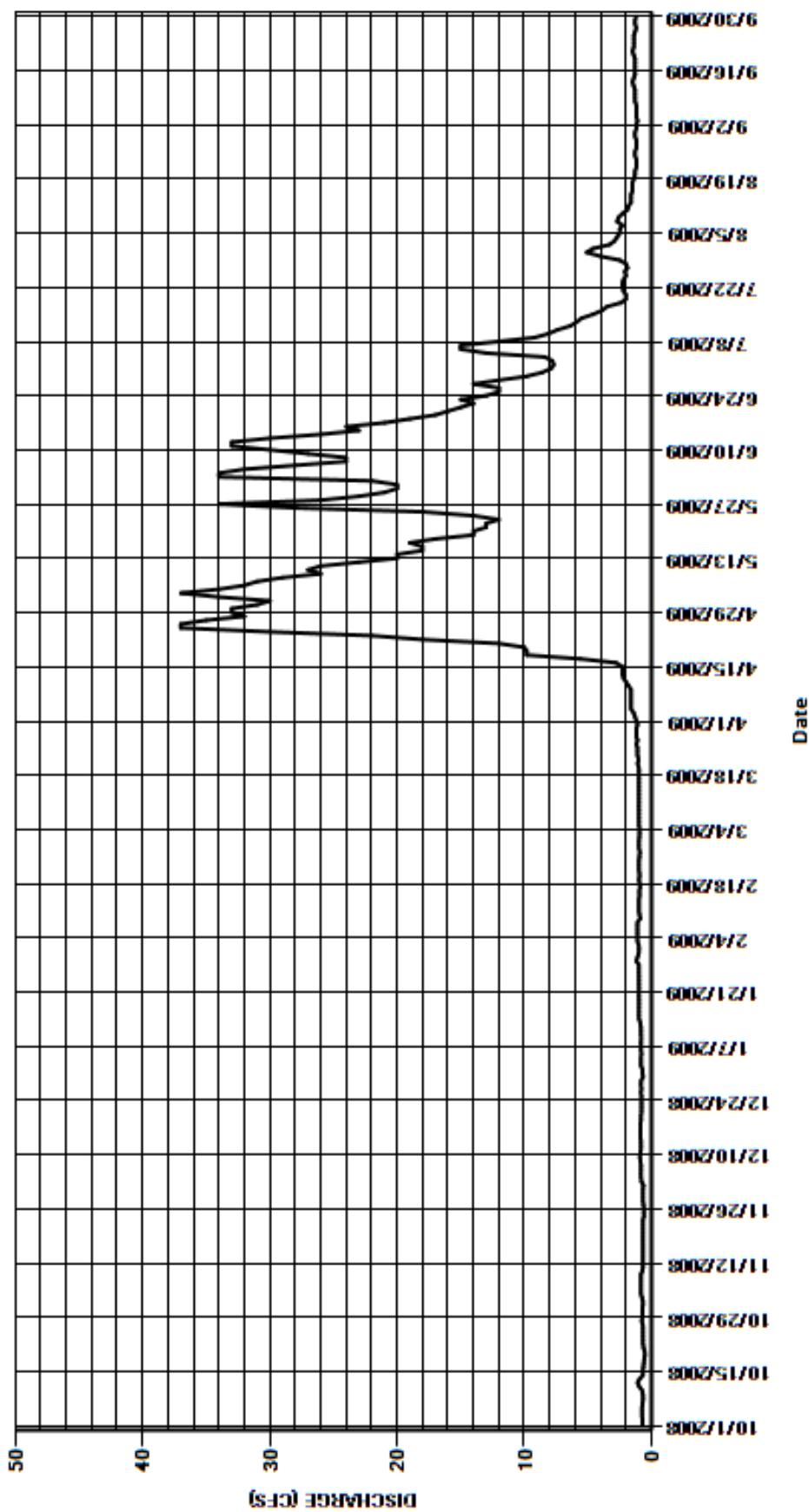
CAL YR	2008	TOTAL	1285.76	MEAN	3.51	MAX	86	MIN	0.53	AC-FT	2550
WTR YR	2009	TOTAL	2147.94	MEAN	5.88	MAX	37	MIN	0.53	AC-FT	4260

MAX DISCH: 41 CFS AT 11:15 ON Apr. 25,2009 GH 5.39 FT. SHIFT -0.03 FT.

MAX GH: 5.39 FT. AT 11:15 ON Apr. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06739500 BUCKHORN CREEK NEAR MASONVILLE
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
Water Year 2009

Location.-- Lat. 40°25'20", Long. 105°13'33", SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, T.5 N., T.70 W., Larimer County.

Drainage and Period of Record.-- N/A.

Equipment.-- A high data rate Sutron 8210 data collection platform (DCP) connected to an incremental shaft encoder placed in the 4 foot by 4 foot pre-cast concrete shelter and concrete well with two three-inch inlets at a concrete lined canal section. A standalone Sutron Stage Discharge Recorder (SDR) is also placed in the shelter and serves as backup. An electric tape gage (ETG) is the primary reference with no supplemental staff gage. AC power is available at the gage and heaters are used to keep the stilling well from freezing in winter months. The station is maintained in cooperation with the State of Colorado Division of Water Resources (DWR), United States Bureau of Reclamation (USBR) and Northern Colorado Water Conservancy District (NCWCD). This gage is a component of the Colorado Big Thompson (C-BT) project.

Hydrographic Conditions.-- Trapezoidal concrete canal with regulated releases from Flatiron Reservoir (HFCFLCO) and Dille Tunnel (DILTUNCO). The Charles Hansen Feeder Canal conveys water released from Flatiron Reservoir and occasionally diverted water from the Big Thompson River via Dille Tunnel to terminal storage at Horsetooth Reservoir. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel.

Gage-Height Record.-- The primary record is hourly averages of 15-minute telemetered data with logged SDR data as back up. Frequent visits by NCWCD, USBR and DWR personnel showed good agreement between sensors and base gage throughout the year with exception to several short periods: November 27, 2008, when the DCP suffered an unknown failure causing erroneous values to be transmitted. SDR data were used to fill in erroneous values without loss of accuracy. July 4 to 7, 2009, when site visits showed the shaft encoder (SE) to be tracking poorly with respect to the primary reference. Several attempts to correct the error were made but good agreement between the primary reference and instrument was not gained until July 7, 2009. The SDR instrument was in good calibration through this period and SDR average daily GH's were used without loss of accuracy. September 10, 2009: GH fluctuating. Visits note variations in SE tracking with respect to primary reference. Daily average SDR GH used since visits showed better calibration. The SDR unit failed to stay in calibration with respect to the primary reference and SE during several events this year. Further inspection of these events showed that calibration was lost when the stage was maintained at or around 3.50 feet. The instrument self-corrected following each of these events. A site visit made on July 27, 2009 found the SDR's counter weight resting on the float causing the instrument to under register. One instrument correction of -0.01 feet was made occurring on January 8, 2009. The record is complete and reliable. Peak stage of 6.61 feet occurred on June 27, 2009 (0900) as recorded by both the DCP and SDR.

Datum Corrections.-- Levels were last run on May 31, 2007. The ETG was found to be within tolerances.

Rating.-- The low flow control is the first fire protection check structure in the canal downstream from the gage. The control for mid to high flows is the canal walls. Rating No. 17, in use since 2005 was continued this year and is defined by measurement from 13 to 503 cfs. One measurement (No. 814) was made this year at a stage of 3.55 feet with a discharge of 209 cfs. The peak flow of 538 cfs occurred at 0900 on June 27, 2009 at a stage of 6.61 feet with a shift of 0.00 ft. It exceeded measurement number 814 made June 25, 2009 by 3.06 feet in stage.

Discharge.-- The rating was applied directly to gage-heights. Historically, measurements within +/-5% of the rating have been adjusted to zero as per agreement with DWR, NCWCD and USBR. This year's measurement (No. 814) showed a shift of -0.03 ft. It was less than one percent from the rating and was therefore adjusted to zero.

Special Computations.-- During periods of no flow, the sensor readings will fall below zero due to draining of the canal and stilling well. Negative stage values are manually edited to 0.00 feet. The SDR unit does not automatically correct for Day-Light Savings Time (DLS) adjustments. As such the SDR log was manually edited to compensate for DLS adjustments prior to being evaluated.

Remarks.-- The record is good. Station maintained and record developed by Russell Stroud.

Recommendations.-- The electric tape gage was slated to be replaced in the 2008 water year but was not replaced in lieu of staffing and time constraints. The ETG should be replaced at the earliest possible convenience. Documentation of the new reference elevation should be made to all DWR, USBR and NCWCD documents. Adjustment of the SDR instrument's float and float tape path needs to be made to correct for interference between the float and counterweight which occurs at or about 3.50 feet of stage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON

RATING TABLE--

HFCBBSO17 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	129	84	188	123	130	217	478	95	115	152	221
2	0	100	84	192	121	128	116	479	114	143	187	226
3	0	49	86	192	117	129	35	478	121	163	202	220
4	0	27	102	192	113	130	33	477	168	181	215	214
5	0	26	92	193	114	153	32	478	153	245	222	212
6	0	25	49	193	113	163	31	473	118	319	174	205
7	0	27	37	194	118	163	30	459	109	237	146	208
8	0	80	46	194	125	164	29	414	133	176	143	270
9	0	113	44	197	130	166	28	362	198	199	165	267
10	166	53	44	208	132	161	28	365	254	223	161	132
11	286	30	45	205	138	158	28	374	270	239	139	21
12	287	36	46	167	139	158	28	376	242	249	107	0
13	291	35	36	113	138	159	28	359	226	246	59	0
14	300	32	97	103	138	159	27	310	229	240	49	0
15	297	55	153	100	138	160	28	338	218	242	42	0
16	287	34	94	101	138	160	81	369	190	254	31	0
17	285	32	76	89	139	318	181	333	196	278	35	0
18	254	31	175	90	80	477	223	283	178	304	38	0
19	233	30	195	90	132	483	216	230	141	315	61	0
20	222	37	186	93	136	483	310	128	218	329	52	0
21	196	47	180	103	140	474	381	114	266	332	58	0
22	82	40	177	111	137	466	446	90	248	261	56	0
23	110	44	178	112	144	466	448	84	268	208	54	0
24	143	40	178	115	151	472	449	94	262	200	50	0
25	220	34	179	121	351	466	454	122	246	116	55	79
26	273	69	180	118	333	465	455	107	299	103	61	107
27	371	86	180	116	246	498	454	61	434	186	66	100
28	296	83	176	118	165	510	461	63	286	229	92	84
29	218	84	171	118	---	475	474	140	141	233	148	90
30	216	84	175	117	---	423	476	144	104	235	188	93
31	157	---	182	117	---	350	---	85	---	148	212	---
TOTAL	5190.00	1592	3727	4360	4189	9267	6227	8667	6125	6948	3420	2749.00
MEAN	167	53.1	120	141	150	299	208	280	204	224	110	91.6
AC-FT	10290	3160	7390	8650	8310	18380	12350	17190	12150	13780	6780	5450
MAX	371	129	195	208	351	510	476	479	434	332	222	270
MIN	0	25	36	89	80	128	27	61	95	103	31	0

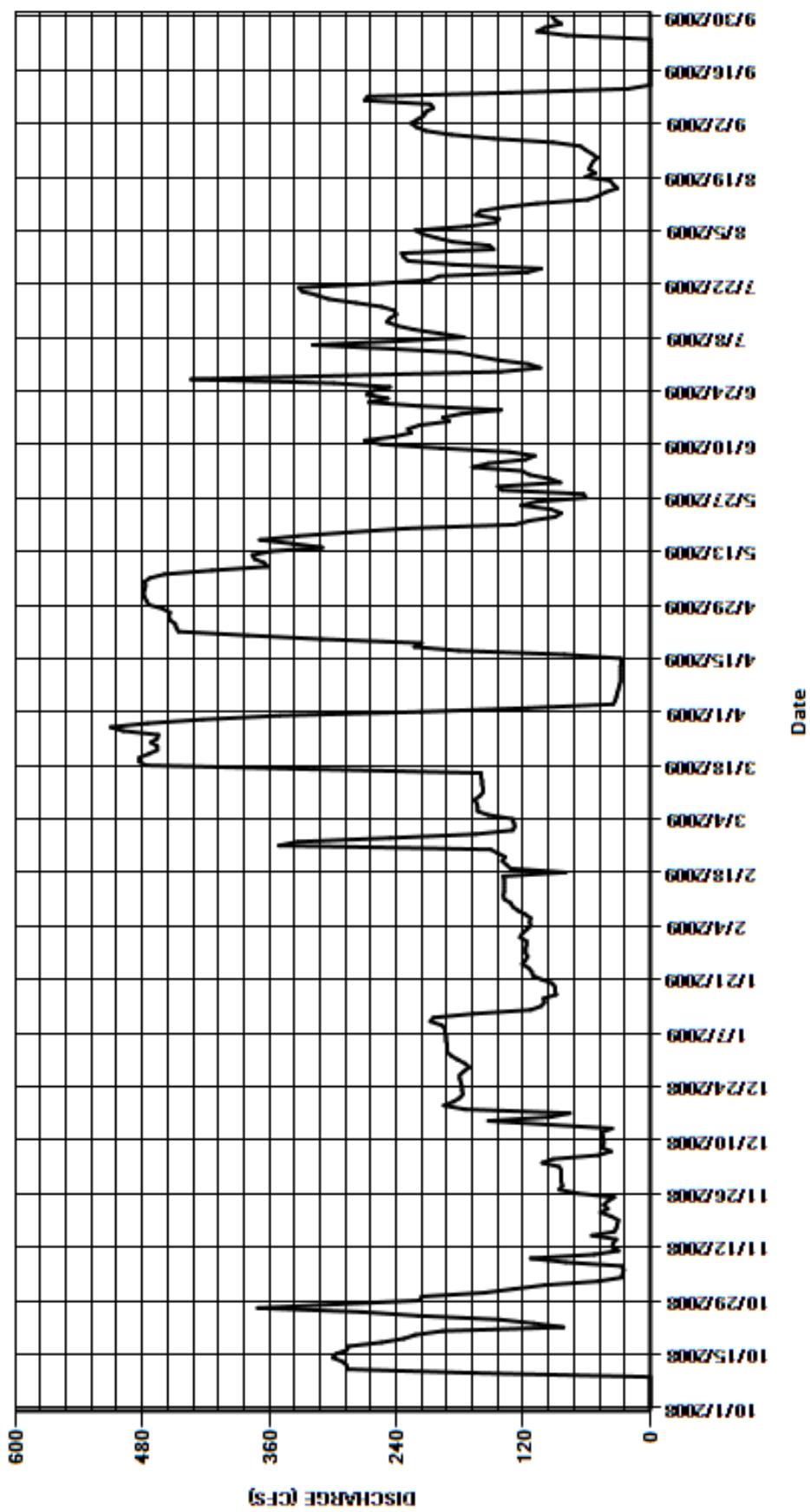
CAL YR	2008	TOTAL	56668.00	MEAN	155	MAX	507	MIN	0	AC-FT	112400
WTR YR	2009	TOTAL	62461.00	MEAN	171	MAX	510	MIN	0	AC-FT	123900

MAX DISCH: 538 CFS AT 09:00 ON Jun. 27,2009 GH 6.61 FT. SHIFT 0 FT.

MAX GH: 6.61 FT. AT 09:00 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON

Water Year 2009

Location.--	Lat 40°25'11", long 105°13'30", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, T.5 N., R.70 W., Larimer County. Hydrologic unit 10190006, on right bank of Charles Hansen Feeder Canal Wasteway, at canal trifurcation, 0.25 miles south of US Route 34, and 7 miles west of Loveland, Colorado.
Drainage and Period of Record.--	N/A.
Equipment.--	Digital incremental Design Analysis H-334 shaft encoder (SE) connected to a Satellite Monitoring Data Collection Platform (DCP) and a Vaisala WXT510 multi-parameter weather sensor in a four foot by four foot precast concrete shelter and concrete well at a 15 foot modified concrete Parshall flume. Gage is equipped with an electric tape gage and a supplemental staff gage is located on the left wing wall of the flume at the Ha location. The well is connected to the flume by two 2-inch inlets with flushing equipment. A timber measurement bridge is located upstream of the Ha location in the converging section of the flume. AC power is available on site. The gage is operated in cooperation with Colorado Division of Water Resources (DWR), United States Bureau of Reclamation (USBR) and Northern Colorado Water Conservancy District (NCWCD) as a component of the Colorado Big Thompson (C-BT) project.
Hydrographic Conditions.--	Semi controlled release often experiencing rapid changes and transient flow. The Charles Hansen Feeder Canal conveys water from Flatiron Reservoir to Horsetooth Reservoir. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel. The HFCWASCO structure serves double duty as both a delivery structure* as well as a safety feature for the Hansen Feeder Canal System within the C-BT system**. *Delivery structure: Due to the placement of the Big Thompson Power Plant (BTPPMCO) and the Handy Ditch company's diversion structure, water cannot be routed through the BTPPMCO structure and then subsequently delivered to the Handy Ditch. Additionally, when the BTPPMCO plant is unavailable for power generation water can be routed through the HFCWASCO structure for subsequent diversion downstream of the HFCWASCO and Big Thompson River's confluence point. **Safety feature: In addition to performing as a water delivery structure, the HFCWASCO structure is used as a safety mechanism. In the event that the BTPPMCO plant were to trip offline, water intended to pass through the BTPPMCO plant would quickly overtop the Hansen Feeder Canal upstream from the plant. Therefore, the Supervisor Control and Data Acquisition (SCADA) system will open three slide gates located in the Hansen Feeder Canal conveying water into the wasteway. The same event would occur if a blockage was detected in the Big Thompson Siphon located immediately downstream from the HFCWASCO diversion point. In the event that the SCADA procedure were to fail, in either event a siphonic spillway also located immediately upstream of the Big Thompson Siphon radial gate would convey water into the wasteway structure. However, water introduced via the siphonic spillway comes in below the Parshall flume's crest and therefore cannot be accurately quantified by this structure.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data taken from DCP with logged SDR data as back up. Frequent visits by NCWCD, USBR and DWR personnel show good agreement between sensors and base gages. Erroneous data collected by the shaft encoder on October 6 and 7, 2008 and August 9, 2009 (unknown cause) were filled in with SDR record without loss of accuracy. The record is complete and reliable, except for September 25, 2009 when brief spike of flow (possibly siphonic) was experienced and recorded for one 15-minute value. Several discrepancies occurred regarding daily maximum and minimum data recorded between the two sensors and are due to the SDR's clock drifting slightly thereby recording values slightly outside the same interval that the DCP records values; it is compounded due to the transient nature of this structure and rapid changes experienced. The SE recorded a peak stage of 2.79 feet on July 14, 2009 (07:00) and the SDR recorded a peak stage of 2.78 feet occurring 15-minutes later. The discrepancy is consider minor and was not investigated further. Zero flow is determined operationally. Due to the placement of the inlets in the structure residual water remains in the stilling well. In previous years, it has been determined that sustained stages of 0.05 feet and below is resultant of residual water in the stilling well and was confirmed by an in-flume inspection on April 3, 2008. A single encoder correction of -0.01 ft. was made on June 24. Comparison with NCWCD readings and the SDR data allowed it to be applied back for only a few days.
Datum Corrections.--	Levels were last run on April 3, 2008 when the electric tape gage was replaced and re-indexed to an elevation of 15.095 feet. The gage and control are both stable and do not require frequent level validation.
Rating.--	The control is a modified 15-foot Parshall Flume with upstream baffle box. The structure is in good condition. Rating No. 2 (HFCWASCO02) is a standard 15-foot Parshall rating up to a gage-height of 2.10 feet and customized upward based on measurements made prior to 1972. An illustration of this break between ratings as well as a tabular computation is provided. One discharge measurement was made this year (No. 109) at a stage of 0.90 ft and a discharge of 47.8 cfs. The peak discharge of 310 cfs occurred at 0700 on July 14, 2009 at a stage of 2.79 feet using a zero shift.
Discharge.--	The rating was applied directly to gage heights. Open water measurements made in previous years showed positive shifting; however, this year's measurement showed slight negative shifting. Regardless, computed shifts for measurements Nos. 107 through 109 were within 5% of the rating and therefore adjusted to the rating. Unadjusted shift for Msmt 109 was -0.01 feet. As per agreement with the USBR, NCWCD and DWR measurements within 5% of the rating have been adjusted to zero. As such, Measurement Nos. 107, 108 and 109 made in the 2006, 2007, and 2009 water years were adjusted to the rating requiring adjustments of 3%, 4%, and -2% respectively.
Special Computations.--	Computed flow was used for September 25, but flow conditions are unknown.

Remarks.--

The record is good, except for September 25 which was estimated and poor. Station maintained and record developed by Russell V. Stroud .

Recommendations.--

A safety evaluation of the timber measurement bridge by a qualified engineer should be performed prior to performing any further discharge measurements from it.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON

RATING TABLE-- HFCWASCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	71	0	0	0	0	0	0	0	1.1	68	0	0
2	54	0	0	0	0	0	0	0	0.01	29	0	0
3	14	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	3.2	0	0
5	0	0	0	0	0	0	0	0	0	0.02	13	0
6	0	0	0	0	0	0	0	6.6	14	0.01	5.6	0
7	0	0	0	0	0	0	0	9.8	20	34	0.01	0
8	0	0	0	0	0	0	0	3.1	5.8	35	0	0
9	0	0	0	0	0	0	0	0	0	16	0	0
10	0	0	0	0	0	0	0	0	0	3.1	20	1.8
11	0	0	0	0	0	0	0	0	0	0	28	0
12	0	0	0	0	0	0	0	0	0	5	28	0
13	0	0	0	0	0	0	0	0	0	54	42	5.3
14	0	0	0	0	0	0	0	0	0	247	48	8.9
15	0	0	0	0	0	0	0	0	0	15	57	8.9
16	0	0	0	0	0	0	0	0	0	10	64	8.9
17	0	0	0	0	0	0	0	0	0	7.6	64	9.3
18	0	0	0	0	0	0	0	0	0	7.3	66	30
19	0	0	0	0	0	0	0	0	0	7.1	30	12
20	0	0	0	0	0	0	0	0.12	13	6.7	14	0
21	0	0	0	0	0	0	0	0	40	8.6	14	0.02
22	0	0	0	0	0	0	0	0	49	8.8	22	0
23	0	0	0	0	0	0	0	2.7	49	7.1	27	0
24	0	0	0	0	0	0	0	11	49	7	25	0
25	0	0	0	0	0	0	0	11	50	6.8	25	0.46
26	2.5	0	0	0	0	0	0	10	51	2.1	24	0
27	1	0	0	0	0	0	0	16	71	0	24	0
28	77	0	0	0	0	0	0	4.4	89	0	30	0
29	0	0	0	0	---	0	0	0	89	0.01	9.8	0
30	0	0	0	0	---	0	0	0	88	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	219.50	0.00	0.00	0.00	0.00	0.00	0.00	74.72	678.91	588.44	680.41	85.58
MEAN	7.08	0	0	0	0	0	0	2.41	22.6	19	21.9	2.85
AC-FT	435	0	0	0	0	0	0	148	1350	1170	1350	170
MAX	77	0	0	0	0	0	0	16	89	247	66	30
MIN	0	0	0	0	0	0	0	0	0	0	0	0

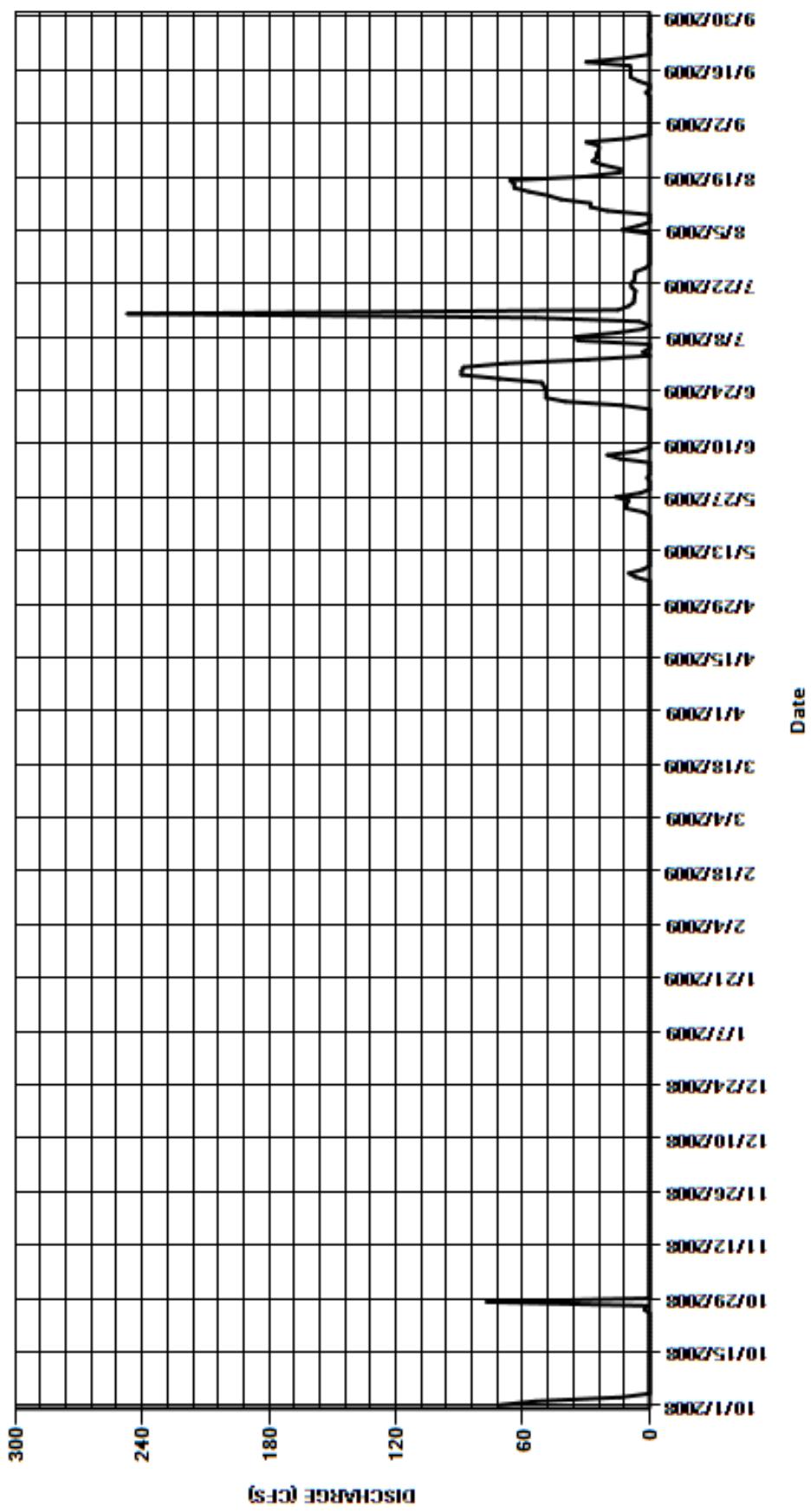
CAL YR	2008	TOTAL	3386.76	MEAN	9.25	MAX	391	MIN	0	AC-FT	6720
WTR YR	2009	TOTAL	2327.56	MEAN	6.38	MAX	247	MIN	0	AC-FT	4620

MAX DISCH: 310 CFS AT 07:00 ON Jul. 14,2009 GH 2.79 FT. SHIFT 0 FT.

MAX GH: 2.79 FT. AT 07:00 ON Jul. 14,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH
Water Year 2009

Location.--	Lat 40°25'15", long 105°13'30", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, T.5 N., R.70 W., Larimer County, Hydrologic unit 10190006, on right bank of Big Thompson River, .25 miles downstream of canyon mouth, 0.25 miles north of US Route 34, and 7 miles west of Loveland, Colorado.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron 8210 Data Collection Platform (DCP) connected to an ultrasonic flow meter placed on the upper scroll casing of the power turbine. A graphical discharge recorder is also connected to the flow meter but has been disabled over the last few years. Power plant facilities are operated and maintained by the United States Bureau of Reclamation (USBR). Satellite telemetry equipment is maintained by Colorado Division of Water Resources (CDWR) staff.
Hydrographic Conditions.--	Controlled release from the Charles Hansen Feeder Canal to the Big Thompson River. Waters transmitted via the Power Plant facility originated at or in part from either Flatiron Reservoir or the Dille Tunnel (DILTUNCO) diversion, both of which convey water to the Hansen Feeder Canal upstream from the Power Plant. Waters passed through the Power Plant facility enter the Big Thompson River downstream from the Big Thompson at Canyon Mouth (BTCANYCO) gage, Charles Hansen Feeder Canal Wasteway to Big Thompson River (HFCWASCO) delivery point, and the Handy Ditch diversion structure (WDID: 0400521).
Gage-Height Record.--	The primary record is hourly averages of recorded and telemetered 15-minute discharge values measured from the ultrasonic instrument. The record is complete and reliable, except for: October 1, 2008. Missing values were filled in from adjacent periods of good record without loss of accuracy, since this was a zero flow period. When the power plant is offline the flow meter generally does not report zero flow values. Rather, values ranging from -2 to 8 cfs are reported by the instrument. These values are erroneous and occurred during periods when the Power Plant facility was winterized or otherwise offline. Erroneous positive and negative values reported from October 1 through 6, 2008 and October 31, 2008 through May 9, 2009 when the facility was winterized were adjusted to zero without loss of accuracy.
Datum Corrections.--	Not applicable.
Rating.--	No rating in use. A ultrasonic flow meter is installed on the turbine inlet casing. No calibration information is available on the meter however; available information on the meter indicate that the meter should be within two percent of actual flow. The power plant discharges directly into the river; water can also be diverted and delivered to the river by either the HFCWASCO or Handy Ditch structures immediately upstream from the power plant. Thus, there are no opportunities to perform comparison measurements. The peak discharge of 488 cfs occurred at 0330 on May 23, 2009.
Discharge.--	Discharge for the year was computed from the telemetered flow meter data. Transmitted values were checked against water orders issued by the USBR as well as USBR monthly accounting information provided to the CDWR office. Computed values were found to be in good agreement with USBR accounting*. *Negligible discrepancies (+/- 1cfs) occur between the computed record evaluated here and USBR provided accounting. Discrepancies are assumed to be caused by precision or rounding differences between the two methods of computation.
Special Computations.--	Indirect validation of the power plant record began in WY 2006 when a mass balance calculator was developed to help quantify the individual gage accuracies and to monitor diversions to and deliveries from the Charles Hansen Feeder Canal system. The calculations indicated that some submergence and variable backwater issues existed at Hansen Feeder Canal below Flatiron Reservoir (HFCFLT CO) gage. In the 2008 water year the USBR purchased and installed an Acoustic Doppler Velocity Meter (ADVM) for the HFCFLT CO gage. Mass Balance computations made since installation of the ADVM unit have shown good agreement with all gages in the Hansen Feeder Canal system, including the power plant.
Remarks.--	The record is good despite the inability for direct confirmatory discharge measurements. Flows were validated by mass balance calculations on the Hansen Feeder Canal. Record developed by Russell V. Stroud.
Recommendations.--	Mass balance computations need to be continued to ensure operational accuracy. The velocity indexed rating at the HFCFLT CO gaging station needs to be further defined and refined. Once complete a robust mass balance analysis should be performed on the Charles Hansen Feeder Canal.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH

RATING TABLE--

STCONVERT USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

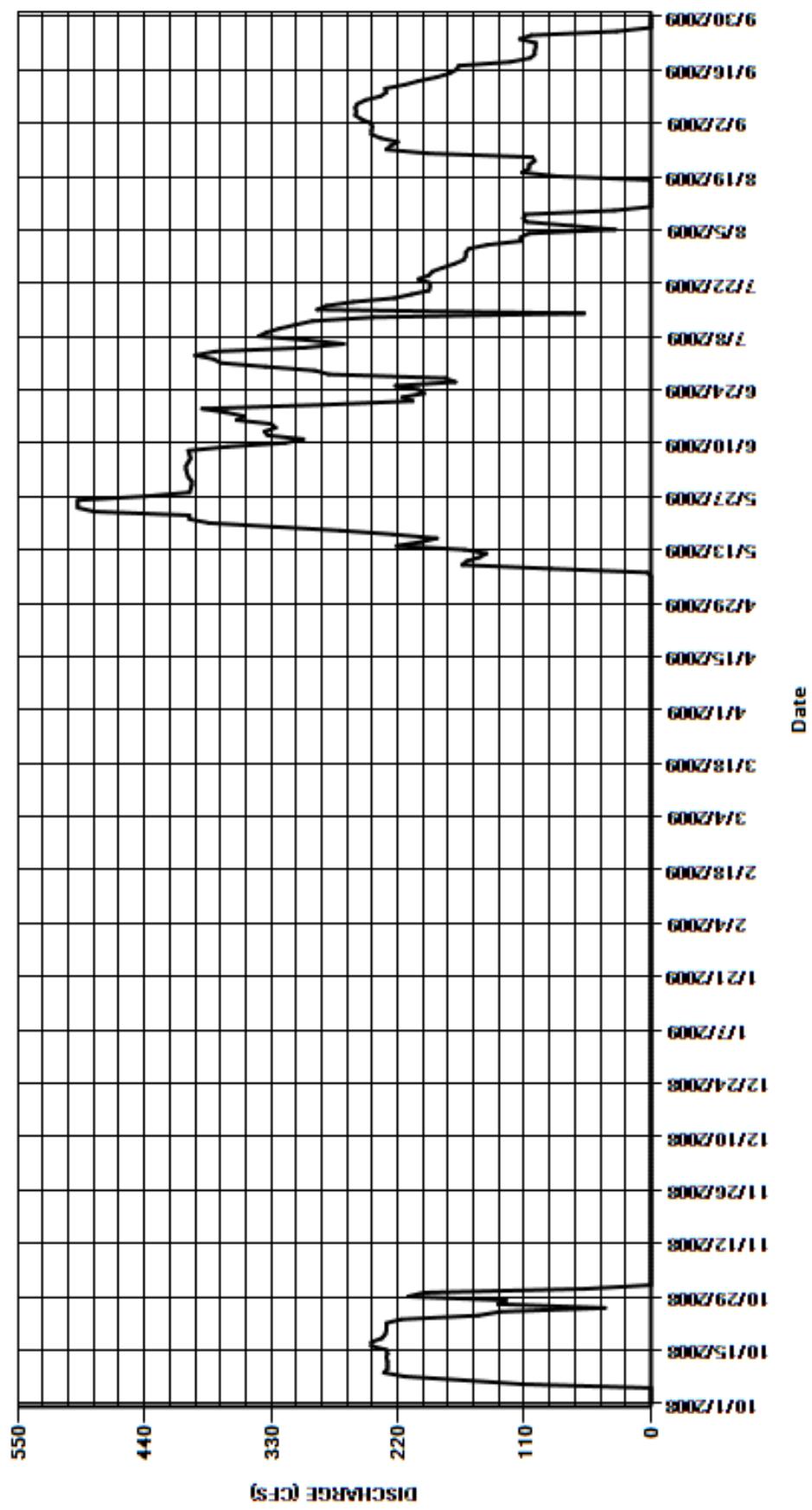
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	402	374	142	242
2	0	0	0	0	0	0	0	0	403	380	113	244
3	0	0	0	0	0	0	0	0	404	396	113	252
4	0	0	0	0	0	0	0	0	404	379	106	257
5	0	0	0	0	0	0	0	0	402	301	31	256
6	113	0	0	0	0	0	0	0	400	267	69	257
7	162	0	0	0	0	0	0	3.1	401	299	108	255
8	214	0	0	0	0	0	0	87	402	341	111	248
9	232	0	0	0	0	0	0	164	368	334	109	235
10	229	0	0	0	0	0	0	160	318	323	32	230
11	229	0	0	0	0	0	0	149	302	309	0	231
12	229	0	0	0	0	0	0	143	333	294	0	214
13	230	0	0	0	0	0	0	162	336	241	0	202
14	229	0	0	0	0	0	0	221	326	58	0	186
15	230	0	0	0	0	0	0	200	330	290	0	175
16	243	0	0	0	0	0	0	186	360	282	0	169
17	243	0	0	0	0	0	0	224	353	259	0	167
18	234	0	0	0	0	0	0	270	369	223	0	122
19	231	0	0	0	0	0	0	327	390	208	82	105
20	230	0	0	0	0	0	0	384	285	193	112	101
21	230	0	0	0	0	0	0	401	207	192	106	101
22	230	0	0	0	0	0	0	401	216	192	106	100
23	217	0	0	0	0	0	0	484	197	202	101	100
24	150	0	0	0	0	0	0	498	202	193	103	114
25	131	0	0	0	0	0	0	498	222	190	194	104
26	40	0	0	0	0	0	0	498	170	181	230	30
27	133	0	0	0	0	0	0	439	179	171	226	0
28	126	0	0	0	0	0	0	401	280	163	220	0
29	211	0	0	0	---	0	0	400	292	161	235	0
30	197	0	0	0	---	0	0	399	335	161	243	0
31	57	---	0	0	---	0	---	399	---	158	243	---
TOTAL	5000.00	0.00	0.00	0.00	0.00	0.00	0.00	7498.10	9588	7715	3135.00	4697.00
MEAN	161	0	0	0	0	0	0	242	320	249	101	157
AC-FT	9920	0	0	0	0	0	0	14870	19020	15300	6220	9320
MAX	243	0	0	0	0	0	0	498	404	396	243	257
MIN	0	0	0	0	0	0	0	0	170	58	0	0

CAL YR	2008	TOTAL	24246.80	MEAN	66.2	MAX	390	MIN	0	AC-FT	48090
WTR YR	2009	TOTAL	37633.10	MEAN	103	MAX	498	MIN	0	AC-FT	74650

MAX DISCH: 498 CFS AT 03:30 ON May. 23,2009
MAX GH: FT. (FLOW METER, NO GH AVAILABLE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
BOULDER CREEK FEEDER CANAL NEAR LYONS
Water Year 2009

Location.--	Lat 40°12'58", long 105°15'28", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.3 N., R.70 W., Boulder County, about 0.2 miles east of Lyons, CO.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Stage Discharge Recorder (SDR) (Model SDR-0001-1) connected to a Sutron Satlink 1 satellite monitoring Data Collection Platform (DCP) / GOES transmitter, transmitting hourly in a rectangular 6 by 8 foot precast concrete shelter at a 10 foot concrete Parshall flume with Ha stilling well. The primary reference is an electric tape gage (ETG) located in the shelter with a supplemental staff located at the Ha location on the right wing wall of the flume. The gage is operated in cooperation with Northern Colorado Water Conservancy District (NCWCD) and the State of Colorado Division of Water Resources (DWR). NCWCD also maintains a Sutron 56-0540 shaft encoder. This instrument is referenced but not maintained by DWR personnel.
Hydrographic Conditions.--	The Boulder Feeder Canal is a component of the water delivery system of the Colorado Big Thompson (C-BT) system owned and operated by NCWCD. The Saint Vrain Supply Canal conveys water from Carter Reservoir to the Saint Vrain and Boulder Creek drainages. Water is measured at the Saint Vrain Supply Canal (15-foot Parshall flume) at Lyons, CO (SVSLYOCO) before bifurcating. Water bifurcated can be delivered to either the Saint Vrain Creek downstream from the Saint Vrain Creek at Lyons, CO (SVCLYOCO) gage and/or can be delivered to the Boulder Feeder Canal (BFCLYOCO) via an inverted siphon under Hwy 66. Water delivered into the BFCLYOCO daylights approximately 300-feet upstream in a linear fashion (allowing sufficient stilling) from the 10-foot Parshall flume. After passing through the Parshall flume water again enters an inverted siphon before being conveyed to terminal storage in Boulder and Coal Ridge Reservoirs through both open and buried sections of canal. Back water from the downstream siphon is not an issue.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered SDR data with logged SDR data as backup. The record is complete and reliable, except for: Positive hourly stage values on November 1 and 2, 2008. Sustained positive stage values after the canal had been shut down for the winter were recorded. Positive stage during this period are suspected to be residual water draining from the siphon and represents no active diversion of water. NCWCD adjusted encoder 0.01 ft on 5/31 when encoder appeared to be only 0.005 off. No net correction applied to record. Following the installation of the SDR (June 20, 2008), the daily count of telemetered values dropped from 96 values per day to 95. Through further investigation, it was determined that the SDR conducted a routine daily at 23:59 (GMT) to compute and log the average daily stage, daily volume and battery voltage. This computational routine caused the SDR to become unavailable to report stage to the DCP during this period. The computational affect of this error was determined to be negligible to the quality of the record and was therefore ignored. This issue was corrected upon reactivation of the gage (April 6, 2009) . The structure is not operated in winter months and was off from November 1, 2008 through April 30, 2009. The DCP was winterized on December 2, 2008 and reactivated on April 6, 2009. NCWCD removes the instrument floats from the stilling well in preparation for winterization. The SDR's stage was set to -0.51 feet on April 6, 2009 in anticipation for canal startup. An instrument calibration adjustment of -0.04 feet was made on May 12, 2009 following activation of the canal. Instrument calibration was supported and validated by 137 visits made by NCWCD and DWR staff to the gage this year. Peak stage of 2.61 feet occurred on August 25, 2009 (11:30).
Datum Corrections.--	Levels are normally run by NCWCD personnel each spring from the ETG to the flume and adjusted by NCWCD personnel accordingly. There is no indication that NCWCD personnel performed levels this year. However, levels were run by DWR staff in the 2006 water year and found to be within allowable tolerances.
Rating.--	The control is a 10-foot Parshall flume. Rating No. 2, a non-standard rating, in use since October 1, 1977, compensates for abnormal approach conditions and was continued this year. Moss growth upstream of the flume does occur in late July through September which can cause velocity loss in the approach section and may cause negative shifts. Get-away conditions are good and submergence is not a problem. Four measurements (Nos. 162-165) were made this water year ranging in discharge from 41.4 to 111 cfs. Discharge measurements made this year as well as three observations of zero flow cover the range in stage experienced. The peak flow of 187 cfs occurred at 1130 on August 25, 2009 at a stage of 2.61 feet using a zero shift. It exceeded Msmt. No. 162 made May 22, 2009 by 0.73 feet in stage.
Discharge.--	Discharge measurements within 5% of the rating have historically been adjusted to the rating as per agreement with NCWCD and the Water Commissioner. Unadjusted shifts ranged from 0.00 to +0.02 feet. Msmt. Nos. 163, 164 and 165 were adjusted 1-2% to 0.00 ft shift. Discharge was computed by applying the rating directly to gage heights.
Special Computations.--	For period of residual positive gage heights: Nov 1-2 2008, discharge was set to zero.
Remarks.--	The record is good. Station maintained and record developed by Russell V. Stroud .
Recommendations.--	Levels should be run in the 2010 water year to verify ETG stability and flume levelness. Opportunities to perform discharge measurements at the low and high stage extremes should be watched for. An Acoustic Doppler Current Profiler (ADCP) vs. current meter measurement validation exercise should be attempted.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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BOULDER CREEK FEEDER CANAL NEAR LYONS

RATING TABLE--

BFCLYOCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	0	0	0	0	0	0	8.2	30	36	33	125
2	19	0	0	0	0	0	0	0	31	42	31	118
3	19	0	0	0	0	0	0	0	30	41	32	118
4	18	0	0	0	0	0	0	0	30	40	35	114
5	24	0	0	0	0	0	0	0	30	40	36	115
6	22	0	0	0	0	0	0	0	30	37	40	115
7	25	0	0	0	0	0	0	0	29	30	38	117
8	24	0	0	0	0	0	0	0	28	24	41	103
9	25	0	0	0	0	0	0	1.5	27	19	41	97
10	27	0	0	0	0	0	0	2.1	27	13	40	105
11	20	0	0	0	0	0	0	8.1	29	11	46	102
12	12	0	0	0	0	0	0	11	29	11	56	113
13	14	0	0	0	0	0	0	4	43	12	51	120
14	13	0	0	0	0	0	0	6.2	54	12	50	124
15	11	0	0	0	0	0	0	6.4	55	15	47	122
16	12	0	0	0	0	0	0	6	54	12	44	97
17	9.1	0	0	0	0	0	0	6.5	54	13	39	69
18	7.9	0	0	0	0	0	0	5.4	57	15	42	65
19	8.9	0	0	0	0	0	0	40	60	30	48	73
20	11	0	0	0	0	0	0	78	53	53	58	71
21	55	0	0	0	0	0	0	91	54	60	98	74
22	129	0	0	0	0	0	0	108	56	56	151	68
23	129	0	0	0	0	0	0	112	57	52	149	50
24	99	0	0	0	0	0	0	80	58	50	142	47
25	104	0	0	0	0	0	0	49	60	49	165	41
26	109	0	0	0	0	0	0	41	60	49	186	43
27	110	0	0	0	0	0	0	33	58	48	186	44
28	109	0	0	0	0	0	0	33	57	39	158	41
29	97	0	0	0	---	0	0	30	45	38	137	50
30	60	0	0	0	---	0	41	30	31	37	138	53
31	24	---	0	0	---	0	---	31	---	32	137	---
TOTAL	1362.9	0.00	0.00	0.00	0.00	0.00	41.00	821.40	1316	1016	2495	2594
MEAN	44	0	0	0	0	0	1.37	26.5	43.9	32.8	80.5	86.5
AC-FT	2700	0	0	0	0	0	81	1630	2610	2020	4950	5150
MAX	129	0	0	0	0	0	41	112	60	60	186	125
MIN	7.9	0	0	0	0	0	0	0	27	11	31	41

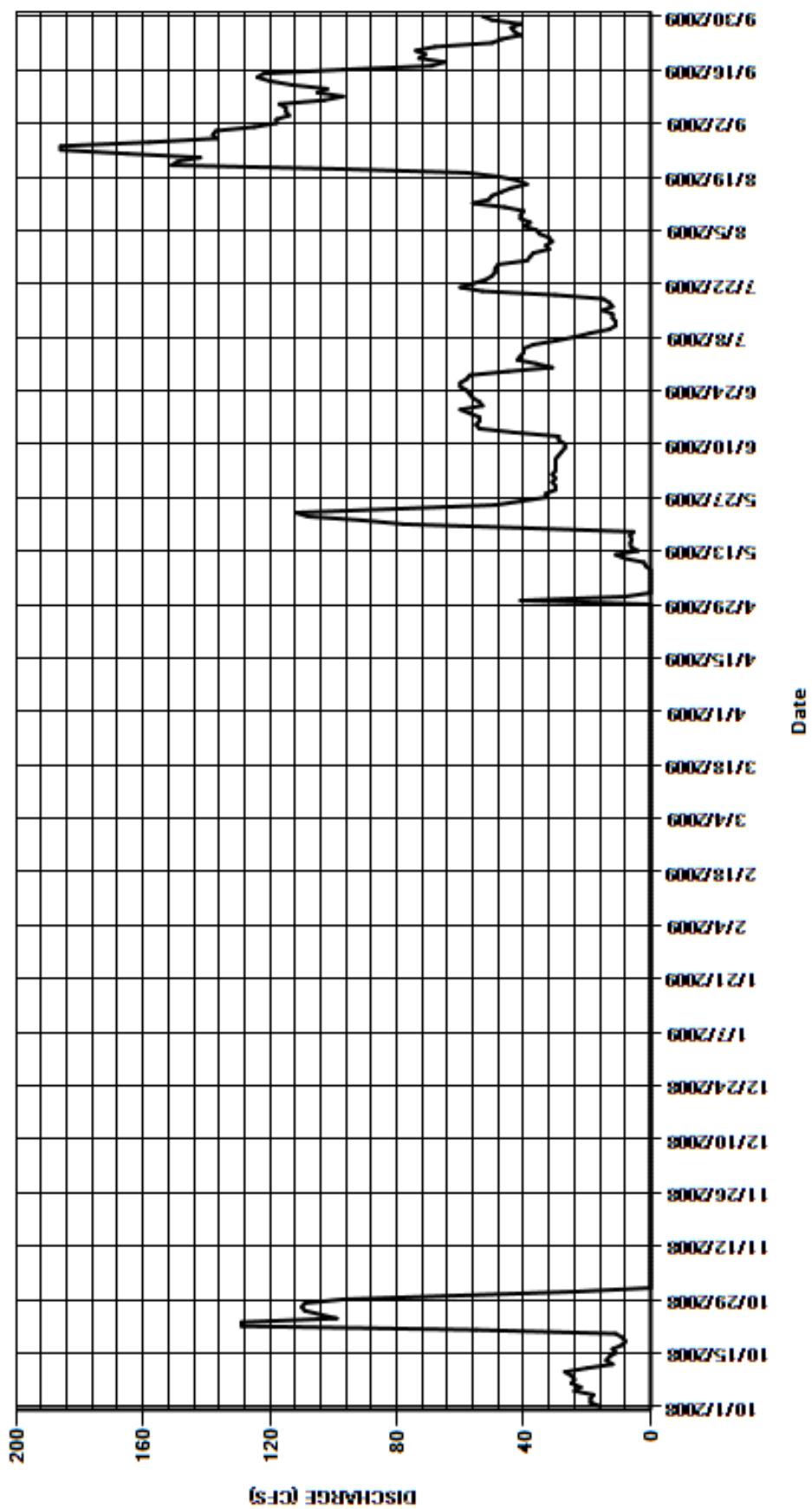
CAL YR	2008	TOTAL	14221.90	MEAN	38.9	MAX	193	MIN	0	AC-FT	28210
WTR YR	2009	TOTAL	9646.30	MEAN	26.4	MAX	186	MIN	0	AC-FT	19130

MAX DISCH: 187 CFS AT 11:30 ON Aug. 25,2009 GH 2.61 FT. SHIFT 0 FT.

MAX GH: 2.61 FT. AT 11:30 ON Aug. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOULDER CREEK FEEDER CANAL NEAR LYONS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO
Water Year 2009

Location.--	Lat 40°13'05", long 105°15'35", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.3 N., R.70 W., Boulder County, about 0.2 miles east of Lyons, CO.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Stage Discharge Recorder* (SDR) connected to a Sutron Satlink Data Collection Platform (DCP) equipped with a GOES satellite High Data Rate (HDR) radio and a graphical stage recorder in a 36-inch corrugated metal pipe shelter overtop a 3-foot square concrete H _a stilling well at a 15-foot concrete Parshall Flume. The primary reference is an electric tape gage (ETG) located on the instrument shelf with a supplemental staff gage located at the H _a location on the right wing wall of the flume. A foot bridge spans the flume with its upstream edge placed at the H _a location. The gage is operated in cooperation of the Northern Colorado Water Conservancy District (NCWCD) and the State of Colorado Division of Water Resources (DWR).
Hydrographic Conditions.--	The Saint Vrain Supply Canal is a component of the water delivery system of the Colorado Big Thompson (C-BT) system and is owned and operated by the NCWCD. The Saint Vrain Supply Canal conveys water from Carter Reservoir to the Saint Vrain and Boulder Creek basins. Releases are measured at the Saint Vrain Supply Canal at Lyons, CO (SVSLYOCO) gage before bifurcation. Bifurcated water can be delivered to either the Saint Vrain Creek downstream from the Saint Vrain Creek at Lyons, CO (SVCLYOCO) gage and/or delivered to the Boulder Feeder Canal (BFCLYOCO). The diversionary point is located downstream from the SVSLYOCO gage below an inverted siphon under Hwy 66. There are several minor diversions along the Saint Vrain Supply Canal before the SVSLYOCO gage (15-foot Parshall flume) location. Water conveyed from Carter Reservoir daylight approximately 0.25-miles upstream from the flume on a hillside due north of the gage. From this point the canal drops down a steep gradient chute into the flume's forebay. A small diversionary point for water deliveries to the Supply Ditch is also located in the SVSLYOCO forebay. Due to the tremendous velocity achieved by the water dropping down the chute, surging flow and unsteady stage are encountered by the SVSLYOCO 15-foot Parshall flume. Backwater from the inverted siphon immediately downstream from the flume is not an issue.
Gage-Height Record.--	Primary data is hourly averages of 15-minute telemetered Encoder or SDR data with logged SDR data or graphical chart record as backup. Shaft Encoder with chart backup was used in October, 2008. The chart recorder was removed by NCWCD over the winter and was not reinstalled when water was started up on May 1. The SDR was installed on May 18 so that the log could provide back-up. NCWCD did re-install the chart recorder on July 2, 2009, but could not locate any of the 2009 WY chart when it was requested. Fortunately there were no gaps in the 2009 DCP record. The record is complete and reliable except for stage values of 0.08 feet and below occurring from November 1 to December 2, 2008 and May 1 to 9, 2009. Residual positive stage with observations of no flow has been observed to occur at a stage of 0.08 feet and below. Therefore, sustained stage values of 0.08 feet and below are believed to be erroneous and are treated as zero. Following the installation of the SDR, the daily count of telemetered values dropped from 96 values per day to 95. Through further investigation, it was determined that the SDR conducted a routine daily at 23:59 (GMT) to compute and log the average daily stage, daily volume and battery voltage. This computational routine caused the SDR to become unavailable to report stage to the DCP during this period. The computational affect of this error was determined to be negligible to the quality of the record and was therefore ignored. This issue has since been resolved; as the SDR's programming has been altered so that the end of day computational routine does not occur. Instrument calibration was supported by 142 visits made by NCWCD and DWR staff to the gage this year. Two instrumentation corrections were applied to the record, a +0.03 ft and a +0.11 ft. These two resulted from attempts by NCWCD to calibrate the instruments below the gage's point of zero flow. The corrections were run full value back to the most recent period of zero flow. Numerous corrections of +/- 0.01 ft were noted and sometimes made by NCWCD personnel. These 0.01 corrections were not applied to the record since they tended to average out and surge in the flume makes it difficult at times to set the stage accurately. This structure is not operated in winter months. The structure is not normally in use from November 1, 2008 through April 30, 2009. The DCP was winterized on December 2, 2008 and reactivated on April 6, 2009. Peak stage of 2.79 feet was recorded by the DCP and SDR instruments occurring on August 27, 2009 (06:30).
Datum Corrections.--	Levels are normally run by NCWCD personnel each spring from the ETG to the flume crest and adjusted by NCWCD personnel accordingly. There is no indication that NCWCD personnel performed levels this year. Levels were last known to be run by both NCWCD and DWR staff in the 2005 water year and were found to be within allowable tolerances.
Rating.--	The control is a 15-foot Parshall flume. Rating No. 5, a non-standard rating, in use since October 1, 1978 was continued this year. Rating No. 5 compensates for abnormal approach conditions resulting from the flume's steep gradient downhill concrete canal chute which gives rise to high approach velocities. Rating No. 5 is skewed to the right of a standard Parshall rating, showing more water than the standard rating. However, due to the aging condition of the canal, the increased approach velocities seem to be progressively offset by friction losses upstream of the flume. Get-away conditions are good; submergence and backwater are not a problem. Four discharge measurements (Nos. 168-171) were made during the year ranging in discharge from 41.7 to 221 cfs. Discharge measurements made this year as well as five observations of zero flow cover the range in stage experienced. The peak flow of 318 cfs occurred at 0630 August 27, 2009 at a stage of 2.79 ft using a zero shift. It exceeded Msmt. No. 171 made September 18, 2009 by 0.59 feet in stage.
Discharge.--	Discharge measurements within 5% of the rating are adjusted to the rating (zero shift) as per agreement with NCWCD and the Water Commissioner. Unadjusted shifts ranged from 0.00 feet to +0.03 feet. Msmt. Nos. 168 to 170 required no adjustment however; No. 171 was adjusted 2% to a shift of 0.00 feet. Discharge was computed by applying the rating directly to gage heights.
Special Computations.--	For periods where the stage was found to be sustained at 0.08 feet and below (November 1 through December 2, 2008 and May 1 to 9, 2009) discharge values were adjusted to zero discharge.

Remarks--

The record is good except for April 30, 2009 through May 12, 2009 when instrument calibration was in question. This period is considered fair. Station maintained and record developed by Russell V. Stroud .

Recommendations--

Levels should be run in the 2010 water year to verify ETG calibration and flume levelness.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO

RATING TABLE--

SVSLYOCO05 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	77	0	0	0	0	0	0	15	31	37	107	263
2	90	0	0	0	0	0	0	0	31	43	56	258
3	99	0	0	0	0	0	0	0	30	42	32	257
4	97	0	0	0	0	0	0	0	30	40	64	252
5	77	0	0	0	0	0	0	0	30	40	88	254
6	50	0	0	0	0	0	0	0	30	37	93	256
7	36	0	0	0	0	0	0	0	30	30	90	261
8	24	0	0	0	0	0	0	0	29	24	93	246
9	26	0	0	0	0	0	0	11	29	19	94	245
10	27	0	0	0	0	0	0	13	29	13	92	258
11	20	0	0	0	0	0	0	14	30	11	113	253
12	12	0	0	0	0	0	0	15	29	11	135	265
13	14	0	0	0	0	0	0	12	43	13	135	271
14	13	0	0	0	0	0	0	15	55	13	134	275
15	11	0	0	0	0	0	0	14	55	17	132	275
16	12	0	0	0	0	0	0	14	55	12	128	248
17	9.1	0	0	0	0	0	0	14	55	70	123	217
18	17	0	0	0	0	0	0	13	58	115	126	213
19	25	0	0	0	0	0	0	51	60	131	132	219
20	27	0	0	0	0	0	0	88	53	161	148	217
21	79	0	0	0	0	0	0	103	55	172	193	186
22	157	0	0	0	0	0	0	119	57	167	239	151
23	156	0	0	0	0	0	0	119	58	163	233	136
24	154	0	0	0	0	0	0	86	58	162	229	101
25	182	0	0	0	0	0	0	54	61	160	258	67
26	187	0	0	0	0	0	0	46	61	154	294	65
27	187	0	0	0	0	0	0	39	58	150	301	62
28	175	0	0	0	0	0	0	35	57	142	269	60
29	180	0	0	0	---	0	0	29	46	143	247	68
30	162	0	0	0	---	0	41	29	31	139	262	70
31	74	---	0	0	---	0	---	30	---	135	273	---
TOTAL	2456.1	0.00	0.00	0.00	0.00	0.00	41.00	978.00	1334	2566	4913	5969
MEAN	79.2	0	0	0	0	0	1.37	31.5	44.5	82.8	158	199
AC-FT	4870	0	0	0	0	0	81	1940	2650	5090	9740	11840
MAX	187	0	0	0	0	0	41	119	61	172	301	275
MIN	9.1	0	0	0	0	0	0	0	29	11	32	60

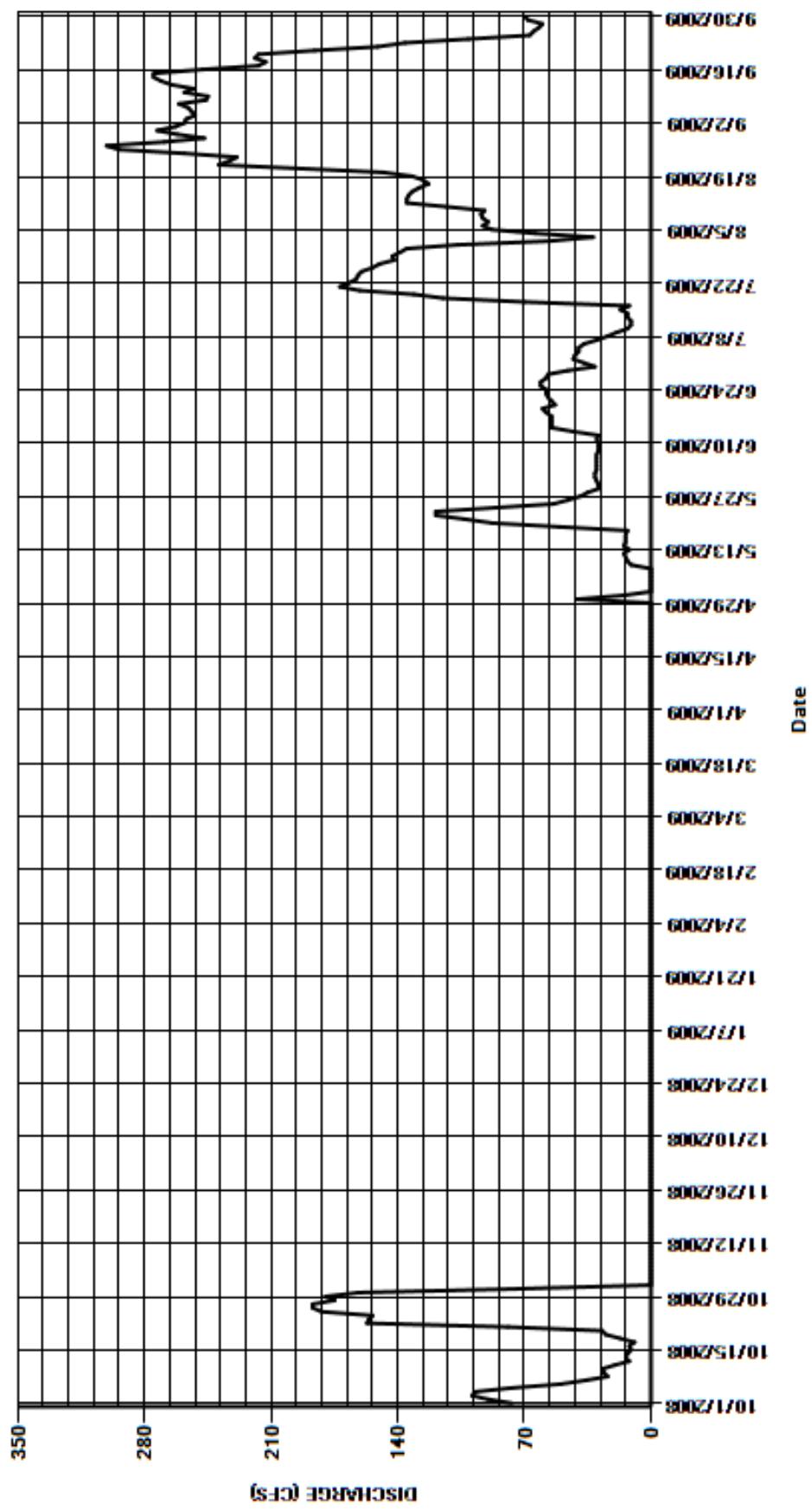
CAL YR	2008	TOTAL	23552.10	MEAN	64.3	MAX	375	MIN	0	AC-FT	46720
WTR YR	2009	TOTAL	18257.10	MEAN	50	MAX	301	MIN	0	AC-FT	36210

MAX DISCH: 318 CFS AT 06:30 ON Aug. 27,2009 GH 2.79 FT. SHIFT 0 FT.

MAX GH: 2.79 FT. AT 06:30 ON Aug. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD
Water Year 2009

Location.-- Lat. $40^{\circ}15'29''$, Long. $105^{\circ}12'21''$, SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, T. 3 N., 70 W., Boulder County, on the left bank, at the mouth of the Canyon, 1800 ft. upstream from the Culver Ditch Diversion and 8.5 mi. southwest of Berthoud, Co.

Drainage and Period of Record.-- 100 mi 2 . 1962-1969, 1993 to present.

Equipment.-- Graphic water stage recorder and Sutron High Data Rate (HDR) Data Collection Platform (DCP) with shaft encoder in a 42-inch metal well with an Electric Drop Tape as the primary reference.

Hydrographic Conditions.-- Drainage area consists of lower elevation scrub oak lands. Natural flows are augmented by Colorado-Big Thompson (CBT) water from a turnout on the Saint Vrain Supply Canal approximately 0.25 miles upstream of the gage. CBT flows enter just below gage.

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. The record is complete and reliable for the period of gage operation, except for partial-record on the gage closing and opening days: November 24, 2008 and March 3, 2009, respectively. The station was closed for winter from November 24, 2008 through March 03, 2009. On the following days the gage height was affected by ice : March 26-27, 2009 . One encoder calibration correction was applied March 4-13, 2009.

Datum Corrections.-- Levels were not run this water year.

Rating.-- The control is a degraded rock dam. Rating No. 12, in use since April 23, 1999, was continued in use this year. It is defined by measurements to 563 cfs. Eleven measurements (597 - 607) were made during the 2009 water year ranging in discharge from 0.43 to 55.3 cfs. They cover the range experienced, except several days in October, November, March and May were below the lowest measurement of 0.43 cfs. These discharges were only a few hundredths lower than the measurement of 0.43 cfs and are considered accurate. Daily discharges above the highest measured discharge of 55.3 cfs are as follows: April 22-26; 2009. The peak flow of 66.6 cfs occurred at 1100 on April 23, 2009 at a gage height of 3.60 ft with a shift of -0.15 ft. It exceeded measurement No. 602, made April 28, 2009 by 0.10 feet ins stage.

Discharge.-- Shifting control method was used all year. Shifts are caused by accumulation and washing out of material on the rock dam control, and vegetation growing in the channel. Open water shifts varied from -0.15 to +0.09 feet. All were given full weight except for measurement 605 which was adjusted 3% to better fit shift distributions. Shifts were distributed as follows. October 1-30: prorated by time using measurements (Nos. 596 - 597). October 30-November 4: hold measurement 597 shift to event. November 4-24: change to measurement 598 shift after event. November 24 – March 3: gage closed. March 3-April 7: prorate shifts by time using measurement Nos. 599 - 600. April 7-15: hold previous measured shift to beginning of runoff (No. 600). April 15-23: distribute shifts by stage using variable stage shift relationship, LTCANYCOVSH01, based on measurements (Nos. 600 - 602) to peak event on April 23 at 1100 hours. April 23-August 31: distribute shifts by stage using variable stage shift relationship, LTCANYCOVSH02 based on measurements (Nos. 602 - 606) from peak event on April 23 at 1100 hours to end of runoff. August 31-September 30: prorate shifts by time using measurements (Nos. 606 - 607).

Special Computations.-- Discharges for November 24, 2008 and March 3, 2009 were estimated from partial record. Only two days were considered ice effected and are as follows: March 26-27, 2009 . These days were estimated from adjacent periods of good record.

Remarks.-- Almost all measurements made had a high maximum discharge per section percentage (often greater than 10%) due to rocky measurement sections. Record is rated fair due to the limits of measurement accuracy, except for periods of ice effect and days with partial record, which were estimated and poor. This gage is a partial year station that is closed in the winter months. Station maintained and record developed by Lee Cunning.

Recommendations.-- An outside staff should be installed and used. A full set of levels should be run and a levels summary sheet brought up to date. The vegetation surrounding the gage needs to be removed so that the control is visible from the gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD

RATING TABLE--

LTCANYCO12 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

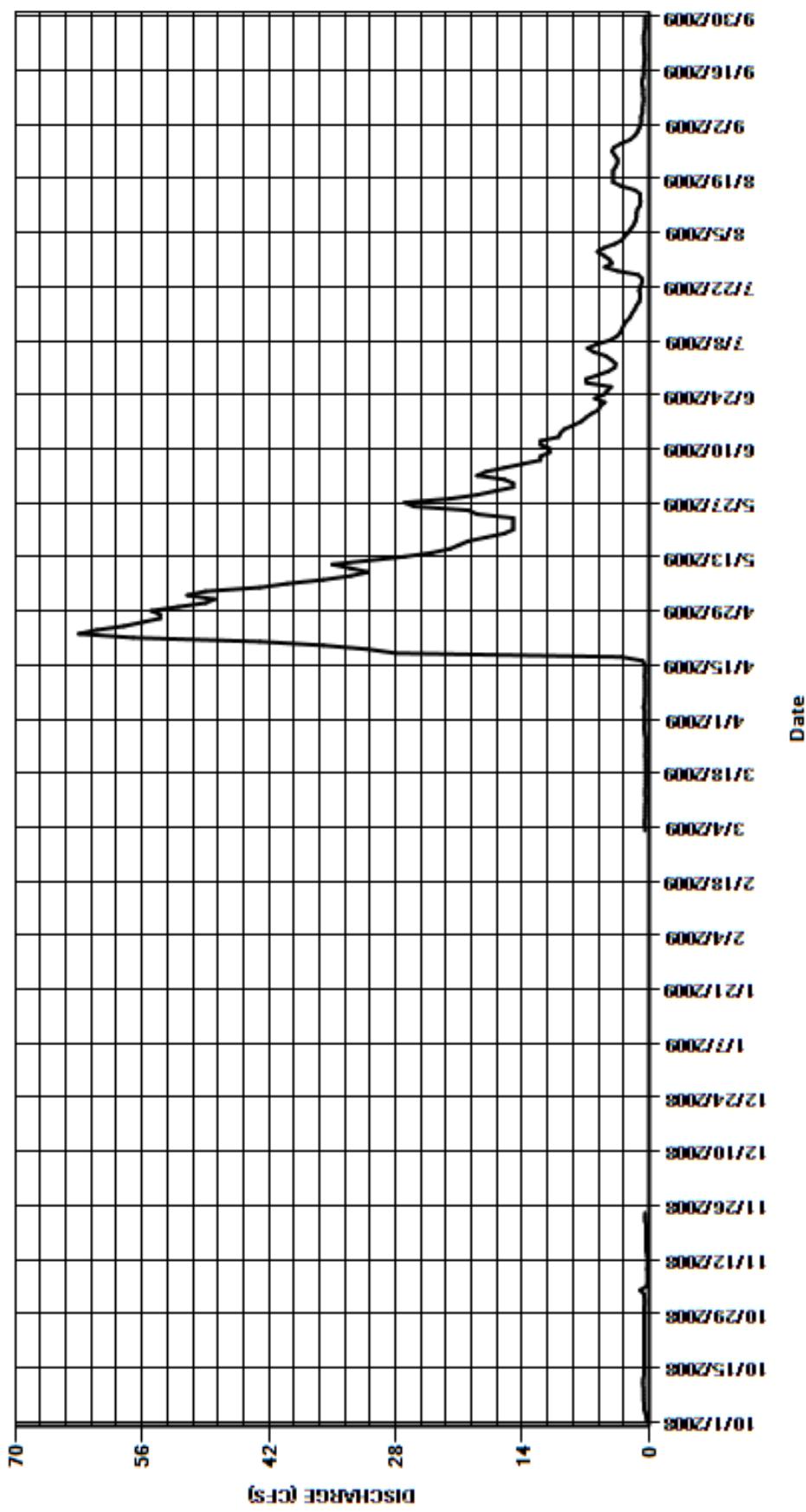
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.27	0.52	---	---	---	---	0.53	49	15	3.8	5	1.1
2	0.29	0.54	---	---	---	---	0.52	48	16	3.7	3.8	0.93
3	0.39	0.57	---	---	---	0.45	0.5	51	19	4.2	3	0.86
4	0.54	1	---	---	---	0.48	0.62	49	18	4.8	2.7	0.89
5	0.55	0.25	---	---	---	0.49	0.51	43	16	6.1	2.3	0.73
6	0.59	0.19	---	---	---	0.48	0.5	40	14	6.8	2	0.73
7	0.59	0.19	---	---	---	0.44	0.47	36	12	5.8	1.7	0.69
8	0.61	0.19	---	---	---	0.44	0.47	33	12	4.4	1.5	0.63
9	0.61	0.21	---	---	---	0.43	0.47	31	11	3.6	1.4	0.63
10	0.64	0.21	---	---	---	0.42	0.47	33	11	3.2	1.4	0.7
11	0.66	0.19	---	---	---	0.4	0.47	35	12	3	1.3	0.66
12	0.65	0.19	---	---	---	0.43	0.5	31	12	2.8	1	0.74
13	0.57	0.22	---	---	---	0.43	0.46	27	10	2.5	0.96	0.82
14	0.57	0.31	---	---	---	0.42	0.44	24	9.8	2.1	1	0.68
15	0.57	0.32	---	---	---	0.41	0.49	22	9.4	1.9	1	0.61
16	0.56	0.32	---	---	---	0.4	0.72	21	8.4	1.6	1.6	0.61
17	0.56	0.32	---	---	---	0.4	3	20	7.5	1.4	3.1	0.61
18	0.57	0.32	---	---	---	0.4	28	18	7	1.1	4	0.55
19	0.55	0.32	---	---	---	0.39	31	16	6.4	1	4	0.49
20	0.57	0.32	---	---	---	0.4	36	15	5.6	1	4	0.49
21	0.57	0.36	---	---	---	0.4	43	15	5.4	1.1	4	0.57
22	0.57	0.44	---	---	---	0.42	57	15	4.9	0.94	3.7	0.57
23	0.57	0.44	---	---	---	0.42	63	15	6	0.81	3.5	0.61
24	0.57	0.45	---	---	---	0.41	61	19	5	0.8	3.5	0.62
25	0.57	---	---	---	---	0.42	58	20	4.6	1.2	3.8	0.61
26	0.57	---	---	---	---	0.4	56	26	4.2	3.5	4.1	0.54
27	0.56	---	---	---	---	0.4	54	27	6.9	4.9	3.9	0.44
28	0.55	---	---	---	---	0.49	54	22	7	4.1	3.1	0.44
29	0.55	---	---	---	---	0.53	55	19	5.7	4.4	2.1	0.42
30	0.55	---	---	---	---	0.55	52	17	4.5	5	1.6	0.44
31	0.53	---	---	---	---	0.52	---	15	---	5.7	1.3	---
TOTAL	17.07	8.39	---	---	---	12.67	659.14	852	286.3	97.25	81.36	19.41
MEAN	0.55	0.35	---	---	---	0.44	22	27.5	9.54	3.14	2.62	0.65
AC-FT	34	17	---	---	---	25	1310	1690	568	193	161	38
MAX	0.66	1	---	---	---	0.55	63	51	19	6.8	5	1.1
MIN	0.27	0.19	---	---	---	0.39	0.44	15	4.2	0.8	0.96	0.42
CAL YR	2008	TOTAL	763.01	MEAN	2.89	MAX	62	MIN	0.15	AC-FT	1510	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	2033.59	MEAN	7.62	MAX	63	MIN	0.19	AC-FT	4030	(PARTIAL YEAR RECORD)

MAX DISCH: 67 CFS AT 11:00 ON Apr. 23,2009 GH 3.6 FT. SHIFT -0.15 FT.

MAX GH: 3.6 FT. AT 11:00 ON Apr. 23,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE
Water Year 2009

Location.--	Lat. 40°21'00", Long. 104°47'04", in SW1/4, SE1/4, Sec. 33, T.5N., R.66 W., Weld County, CO, on left bank just southeast of gage on Evans Town Ditch, 0.7 miles upstream from bridge on WCR 396, 1.6 miles upstream from mouth and 4 miles West of LaSalle, CO.
Drainage and Period of Record.--	828 mi ² . 1951 to present.
Equipment.--	Sutron Satlink2 DCP and shaft encoder with a backup graphic water stage chart recorder in a 4 ft by 4 ft timber shelter and a 48-in metal well. Primary reference gage is an electric tape gage (ETG). The well is connected to stream by two 2-inch intakes attached to a funnel-flushing device. Outside gage is a cantilever chain gage 12 feet downstream (Chain Gage is in complete dis-repair and unusable). Elevation is 4,680 ft above MSL from topographic map. Concrete control was established in June of 1966.
Hydrographic Conditions.--	Drainage area consists of high mountain terrain, municipal and agricultural areas. Gage is located downstream from many agricultural diversions which attempt to divert all available water. Flow is mostly seepage, return flows from agriculture, local runoff and municipal runoff and wastewater. The Colorado-Big Thompson (CBT) project historically releases 'carry-over' water at the end of October every year to downstream users that have rights to that water.
Gage-Height Record.--	The primary record is hourly averages of 15-minute transmitted data with chart back up. Daily maximum and minimum stages for the satellite record agreed within +/- 0.02 feet of the chart. The record is complete and reliable, except for the following days: December 15 – 28, 2008 January 26 – 31, 2009, when the gage was ice affected. November: 7-10, 15-18, 2008, the shaft encoder went to zero and chart recorder clock stopped during this period. The 'pen trace' while the clock was stopped did not fluctuate more than 0.05 feet in gage height. Record was estimated using adjacent periods of good record. Four instrument corrections were made this water year and are as follows. March 21 – April 13, 2009: moss buildup was cleaned from control on April 13, 2009 causing a -0.06 ft drop in gage height. This correction was made by time proration back to March 21. April 20 – May 15, 2009: moss buildup was cleaned from control on May 15, 2009 causing a -0.03 ft drop in gage height. This correction was made by time proration back to April 20. May 29 – June 12, 2009: comparison with corrected chart readings indicated SE was over-corrected -0.01 feet by Water Commissioner. The SE was adjusted +0.01 feet on next visit resulting in these corrections to the record: May 15 (0.00) to May 29 (-0.01) and May 29 (+0.01) to June 12 (+0.01)
Datum Corrections.--	Levels were run September 4, 2008. Gage was found to read 0.005 feet low. No corrections made.
Rating.--	The control is a 50-60 foot smooth concrete control on bedrock, about 2 feet high with rounded crest, located about 20 feet below the gage. Rating table No. 25, in use since April 29, 1999, was continued in use this year. Rating No. 25 is well defined to 6000 cfs. Fifteen measurements (Nos. 545 - 559) were made during the 2009 water year and were used in this analysis. They ranged in discharge from 1.14 to 212 cfs. Measurements covered the range in stage experienced except the lower mean daily flows on May 15-18, 2009, and the higher mean daily flows on October 29-31, 2008 , April 18, May 23, 2009 . The peak flow of 321 cfs occurred 0845 on April 18, 2009 at a gage height of 2.61 ft with a shift of -0.04 ft.
Discharge.--	Shifting control method was used all year. Shifts are caused by material scouring and filling the pool behind the control. Shifts were applied as defined by measurements and were distributed by time with some considerations to stage. Measurements show shifts varying between -0.06 and -0.01 ft; all but two were given full weight. Measurements 551 and 558 were adjusted -5% and 3% respectively to better fit shift distributions. Measurement 548 made on December 18, 2008 during the ice effected period mentioned above is considered poor due to unreliable gage height data for that period of record.
Special Computations.--	Discharge for the following ice affected periods was estimated by interpolation between periods of good record and temperature trends. Discharge for November: 7-10, 15-18 was estimated by interpolation to adjacent good record, and assuming that the flows remained within the narrow range defined by the chart pen (when the clock was stopped.).
Remarks.--	The record is good except for the following days: November: 7-10, 15-18, which are fair due to incomplete record. and, December 15 – 28, 2008; January 26 – 31, 2009, which are estimated and poor due to ice.
Recommendations.--	Efforts need to be made to get higher flow discharge measurements. Station maintained and record developed by Lee Cunning.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE

RATING TABLE--

BIGLASCO25 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

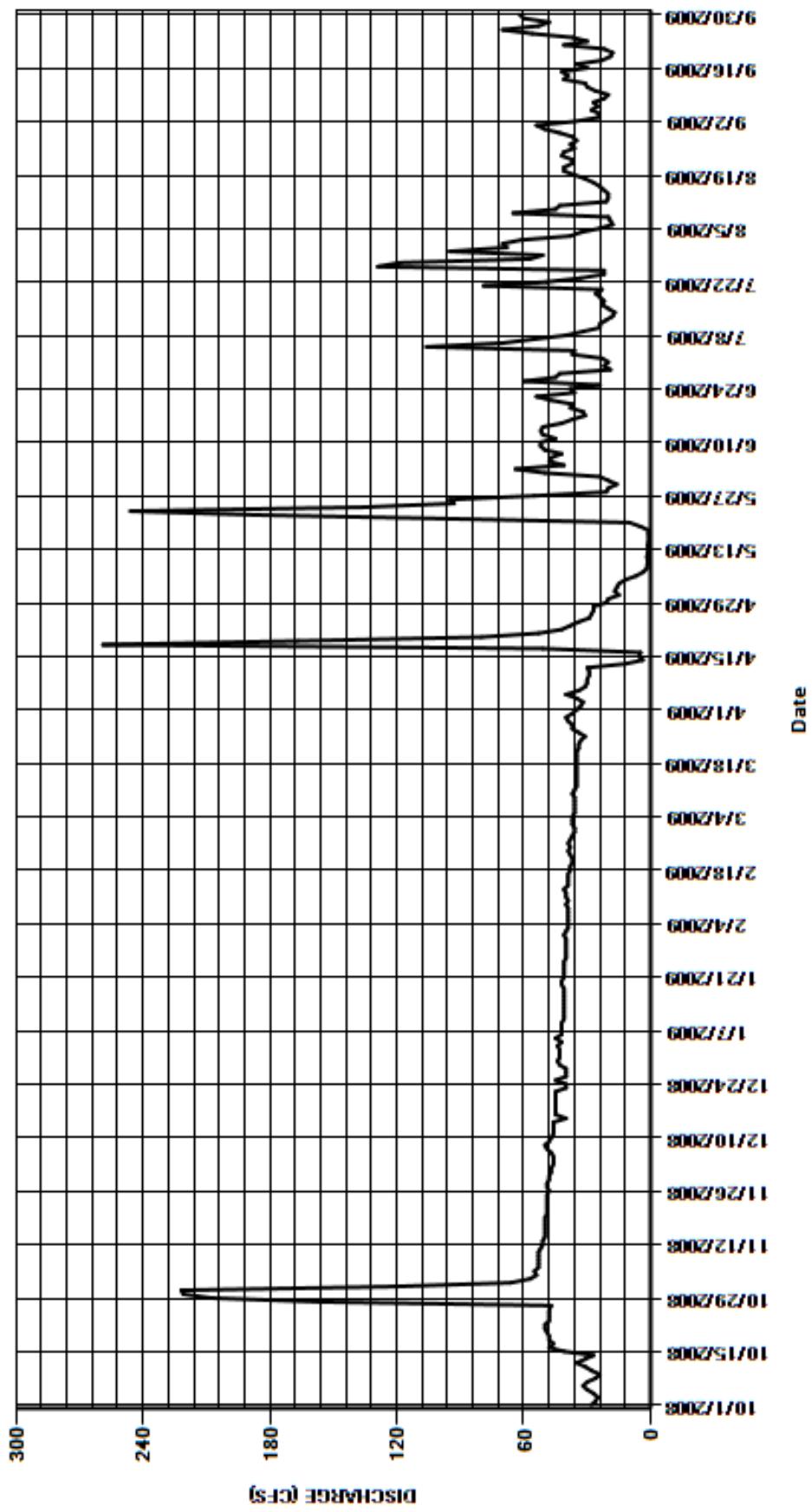
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	121	47	43	41	36	35	15	24	20	70	54
2	26	66	47	43	40	37	33	17	50	23	61	36
3	25	57	46	44	39	37	32	16	64	37	38	25
4	27	54	46	42	39	37	35	15	41	36	33	24
5	30	55	46	45	39	36	40	12	48	106	24	28
6	32	53	47	42	39	36	34	7	47	70	18	25
7	30	53	49	42	39	36	31	3.6	42	55	19	27
8	26	53	50	42	39	36	30	1.8	50	40	20	22
9	24	53	48	42	40	36	30	1.6	52	32	65	20
10	28	53	47	41	39	37	29	1.4	52	24	45	26
11	31	52	46	41	40	36	29	1.7	45	24	43	30
12	35	51	46	41	40	35	30	1.4	51	21	21	31
13	31	51	46	41	41	35	12	1.2	52	18	20	41
14	27	50	46	41	39	35	3.7	1.4	51	17	20	39
15	41	50	40	41	39	35	5.5	1	42	20	22	42
16	48	50	45	41	39	35	4.8	0.86	37	23	24	30
17	46	50	45	41	39	35	51	1.1	31	22	27	35
18	48	50	45	41	38	35	259	1	32	24	31	23
19	48	50	45	42	38	35	167	5	38	26	36	19
20	49	49	45	42	37	35	80	10	37	23	41	18
21	50	49	45	41	37	35	53	96	47	79	41	22
22	50	49	45	41	38	34	42	187	54	49	37	41
23	48	49	40	41	39	34	38	246	36	33	37	30
24	48	49	40	41	38	33	34	136	38	22	42	37
25	48	49	45	41	39	31	29	93	24	22	41	56
26	48	48	40	40	38	34	28	95	60	129	36	70
27	47	49	40	40	37	37	27	55	45	119	38	53
28	157	49	40	40	36	37	27	21	43	57	35	48
29	208	48	43	40	---	39	21	20	19	51	37	60
30	221	48	44	40	---	40	20	16	22	95	43	62
31	222	---	43	40	---	37	---	20	---	68	50	---
TOTAL	1827	1608	1387	1283	1086	1106	1290.0	1100.06	1274	1385	1115	1074
MEAN	58.9	53.6	44.7	41.4	38.8	35.7	43	35.5	42.5	44.7	36	35.8
AC-FT	3620	3190	2750	2540	2150	2190	2560	2180	2530	2750	2210	2130
MAX	222	121	50	45	41	40	259	246	64	129	70	70
MIN	24	48	40	40	36	31	3.7	0.86	19	17	18	18
CAL YR	2008	TOTAL	14347.68	MEAN	39.2	MAX	222	MIN	0.98	AC-FT	28460	
WTR YR	2009	TOTAL	15535.06	MEAN	42.6	MAX	259	MIN	0.86	AC-FT	30810	

MAX DISCH: 321 CFS AT 08:45 ON Apr. 18,2009 GH 2.61 FT. SHIFT -0.04 FT.

MAX GH: 2.61 FT. AT 08:45 ON Apr. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06752000 CACHE LA POUDRE AT CANYON MOUTH NEAR FORT COLLINS
Water Year 2009

Location.-- Lat. 40°39'52", Long. 105°13'26", in NW $\frac{1}{4}$ sec. 15, T.8 N., R.70 W., Larimer County, Hydrologic Unit 10190007, on left bank at mouth of canyon, 0.5 mi downstream from headgate of Poudre Valley Canal, 1.2 mi upstream from Lewistone Creek, and 9.3 mi northwest of courthouse in Fort Collins.

Drainage and Period of Record.-- 1,056 mi². Sporadic and somewhat unreliable data from June 1881 to Aug. 1883. Reliable data from Oct. 1883 to current year. Periodic water-quality data from 1962 to 1995.

Equipment.-- Graphic water stage recorder and satellite monitoring in a concrete shelter and stilling well. The Data Collection Platform is a High Data Rate Satlink I logger with speech card. The hourly transmissions give the commissioner's office the ability for real time readings. A temperature sensor was installed in September 2008. The primary reference gage is an Electric drop Tape Gage (ETG). There is a supplemental chain gage.

Hydrographic Conditions.-- Drainage area consists of forested high mountain terrain. The runoff in the Cache la Poudre basin was about normal this year.

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. The record is complete and reliable, except for the following periods. Partial day records on December 5, 2008 when the station was closed for the winter and reopened on February 21, 2009. The stage discharge relationship was affected by ice on November 25, December 4, 2008 and February 22, 2009. The gage was visited and chart and encoder calibration was checked at least weekly, so accuracy was well maintained. Satellite mean gage heights checked with chart values to within +/- 0.02 ft. Missing satellite data was filled in with chart data with no loss of accuracy.

Datum Corrections.-- Levels were run August 27, 2009 and the gage was found to read correctly. ETG was measured at 13.110 ft Reference Mark (R.M.) #3 was re-assigned from an elevation of 10.790 to an elevation of 10.800 per levels. This change also re-assigned R.M. #1 from an elevation of 7.980 to an elevation of 7.990. A new R.M. #4 was established during levels at an elevation of 9.859. One levels correction of (+0.01 ft) was applied from the day levels were ran on August 27, 2009 through the end of the Water Year on September 30, 2009.

Rating.-- Control is a rock and gravel riffle about 100 feet downstream. This riffle was not removed and is still the control. Fill and scour will still cause minor shifting. Rating No. 11 was used until 0900 May 4, 2009. A new rating (CLAFCCO12) was developed to better define the upper range of discharges. This rating was used from 1000 May 4, 2009 through the end of the water year. It is well defined throughout the range and stage experienced. The transition was made on Measurement 476, made on May 4. Thirteen measurements (470 - 482) were made this year, ranging in discharge from 22.5 to 1,460 cfs. They cover the range in discharge experienced very well. Measurements were made on or near the peak and low flow days. The peak flow of 1,920 cfs occurred at 0500 on May 25, 2009 at a gage height of 4.74 ft with a shift of 0.00 ft. It exceeded the gage height of measurement No. 477, made on May 20, 2009 by 0.42 feet.

Discharge.-- Shifting control method was used all year. Shifts are caused by moss growth and by material moving in and out of the control section. Shifts were prorated by time for the entire water year. Rating CLAFCCO11 was used from October 1, 2008 to 0900 May 4, 2009. A zero shift was used for the entire period. Open water measurements 470-476 show unadjusted shifts varying from -0.01 to +0.01 ft. Measurements were given full weight except Measurements 472 and 474 were adjusted 2% to zero shift. Rating (CLAFCCO12) was used from 1000 May 4, 2009 through the end of the water year. Zero shift was used for the entire period. Open water measurements 476-482 show unadjusted shifts varying between -0.04 and +0.01 feet. Measurements were given full weight, except Measurements 477-479, 482 were adjusted up to 3% to zero shift. Measurement 476 had zero shift on both rating tables.

Special Computations.-- Discharges from December 5, 2008 through February 21, 2009 were taken from water commissioner diversion estimates and are considered estimated and poor.

Remarks.-- The record is good, except for the following periods. The record was estimated and considered poor from December 5, 2008 through February 21, 2009, when station was closed for the winter. For November 25, December 4, 2008 and February 22, 2009 the stage discharge relationship was affected by ice and the record is considered fair. Station maintained and record developed by Lee Cunning.

Recommendations.-- Make more high water measurements when flows occur.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06752000 CACHE LA POUDRE AT CANYON MOUTH NEAR FORT COLLINS

RATING TABLE--

CLAFTCCO11 USED FROM 01-Oct-2008 TO 04-May-2009
CLAFTCCO12 USED FROM 04-May-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

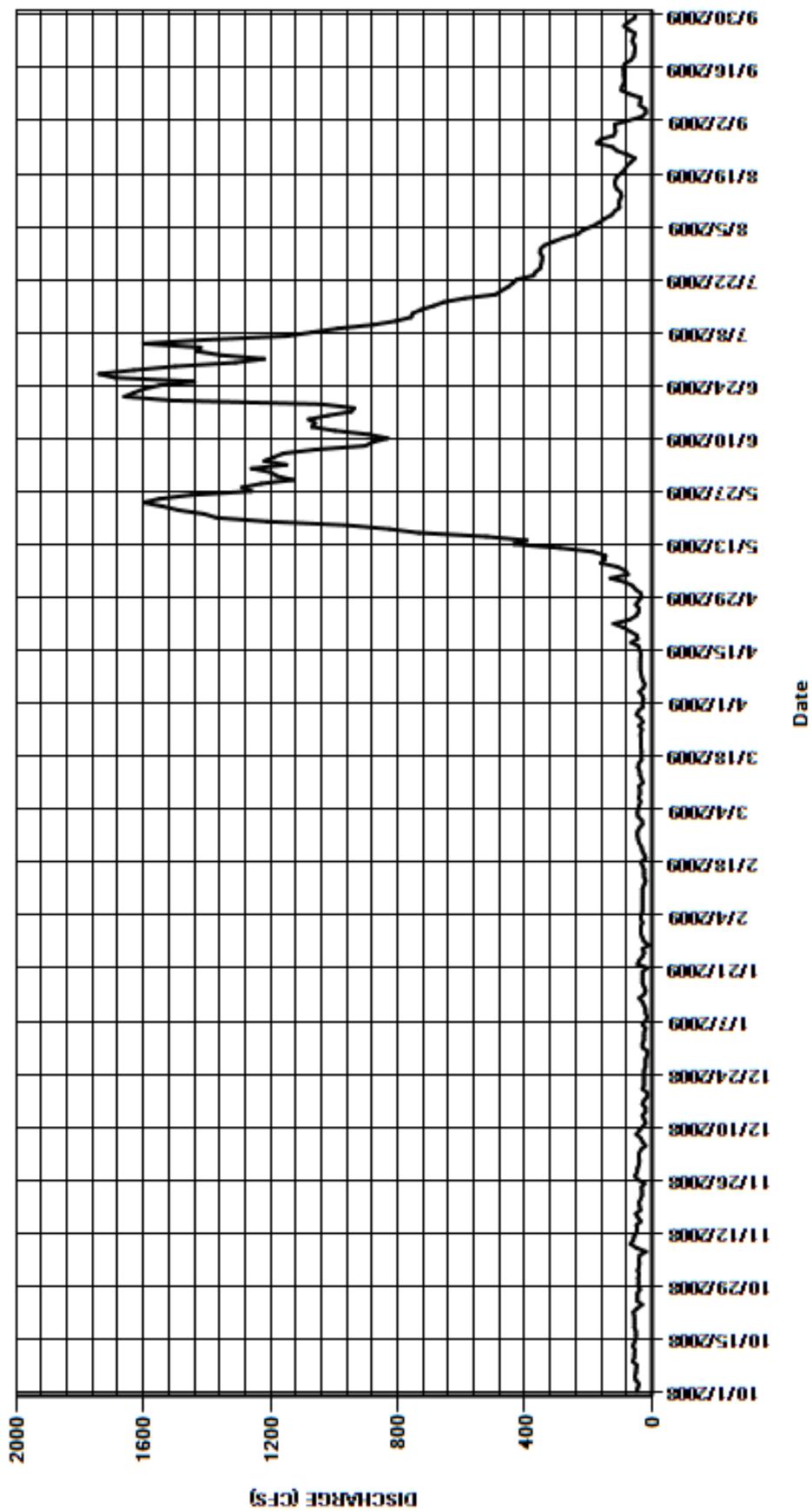
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	40	40	30	35	32	31	51	1200	1220	309	117
2	45	45	41	25	30	44	27	61	1260	1360	277	73
3	41	41	41	25	35	46	31	85	1150	1430	234	32
4	51	40	35	25	35	44	40	131	1220	1420	218	19
5	54	41	20	20	30	40	27	76	1190	1600	189	20
6	51	39	30	30	30	36	23	84	1160	1410	166	39
7	50	19	35	20	30	42	29	109	1060	1150	150	37
8	48	49	50	15	30	38	33	162	902	1070	127	35
9	61	68	40	20	30	38	35	149	879	988	118	72
10	56	59	30	20	30	41	37	147	832	876	102	97
11	56	57	20	25	30	29	37	185	892	805	104	94
12	54	49	25	30	25	33	37	289	998	758	102	87
13	60	47	30	40	20	38	36	435	1070	753	96	87
14	56	49	20	25	25	39	35	394	1060	726	99	89
15	51	35	20	20	25	44	39	521	1080	687	112	89
16	51	44	30	25	25	42	42	733	1020	655	116	91
17	51	51	25	30	30	33	65	826	947	589	116	85
18	56	36	15	30	35	34	45	958	937	492	112	66
19	55	39	15	30	20	33	49	1210	1040	474	98	57
20	55	41	30	30	25	34	70	1370	1510	453	86	56
21	56	36	25	15	31	34	90	1410	1660	438	79	53
22	59	31	25	45	33	34	121	1490	1630	425	66	56
23	47	32	25	40	40	36	72	1540	1600	373	53	62
24	31	33	25	30	44	36	51	1600	1550	366	78	58
25	47	24	25	25	46	32	43	1550	1440	351	111	53
26	46	44	20	30	46	40	41	1450	1690	349	124	73
27	46	54	20	10	40	29	51	1260	1740	346	174	88
28	38	47	20	25	30	35	43	1290	1630	345	162	74
29	44	46	15	30	---	49	33	1230	1500	352	121	56
30	42	41	15	35	---	42	35	1130	1310	351	115	52
31	44	---	30	35	---	29	---	1180	---	339	116	---
TOTAL	1550	1277	837	835	885	1156	1348	23106	37157	22951	4130	1967
MEAN	50	42.6	27	26.9	31.6	37.3	44.9	745	1239	740	133	65.6
AC-FT	3070	2530	1660	1660	1760	2290	2670	45830	73700	45520	8190	3900
MAX	61	68	50	45	46	49	121	1600	1740	1600	309	117
MIN	31	19	15	10	20	29	23	51	832	339	53	19
CAL YR	2008	TOTAL	111691.6	MEAN	305	MAX	2170	MIN	9.6	AC-FT	221500	
WTR YR	2009	TOTAL	97199	MEAN	266	MAX	1740	MIN	10	AC-FT	192800	

MAX DISCH: 1920 CFS AT 05:00 ON May. 25,2009 GH 4.74 FT. SHIFT 0 FT.

MAX GH: 4.74 FT. AT 05:00 ON May. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06752000 CACHE LAPOUDRE AT CANYON MOUTH NEAR FORT COLLINS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06752500 CACHE LA POUDRE NEAR GREELEY
Water Year 2009

Location.-- Lat. $40^{\circ}25'04''$, Long. $104^{\circ}39'22''$, in NW $\frac{1}{4}$ sec. 11, T.5 N., R.65 W., Weld County, Hydrologic Unit 10190007, on right bank 15 ft. downstream from highway bridge, 2.9 mi east of courthouse in Greeley, and 3.0 mi upstream from mouth.

Drainage and Period of Record.-- 1,877 mi 2 . 1903 to current year.

Equipment.-- Graphic water stage recorder, satellite monitored data collection platform (Sutron Model 8210 DCP with High Data Rate GOES radio) and shaft encoder in a 48-inch metal pipe (CMP) shelter and well. Primary reference is an electric drop tape inside well. The outside gage is a wire weight on the bridge approximately 30 feet upstream of the station.

Hydrographic Conditions.-- The snow pack in the Cache la Poudre basin produced a runoff that was about normal at the Mouth of the Canyon gage. Gage is located downstream of the City of Greeley Wastewater Treatment Facility and can show small diurnals from this effluent. This station is susceptible to rapid increases in stage due to storm runoff events from hardened surfaces within the City of Greeley. CBT deliveries of several hundred cfs for a few days duration also pass the gage.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable. Checks between the primary and backup records agreed within ± 0.02 feet. Instrument calibration is supported by 34 visits made to the gage this water year.

Datum Corrections.-- Levels were run on June 22, 2009 and a new Reference Mark (R.M.) number 4 was established as a pin in the right downstream wing-wall next to the station (EL = 9.040). Verification levels will need to be run in the next water year.

Rating.-- The control is a gravel channel and a downstream riffle. The gage is located just below a county road bridge. Large gravel bars form behind the bridge and directly in front of the gage, dividing the flow into channels at times. The channel by the gage is the main channel at flows up to about 300 cfs, after this, flows begin to flow in the heavy deposition and vegetation across the entire width of the channel. Rating No. 27, dated January 4, 2010, was developed and used for water year 2009. Rating number 27 is well defined from 50 to 4500 cfs. Sixteen measurements (Nos. 1027 - 1042) were made this year ranging in discharge from 50.4 to 1270 cfs. They cover the range in stage experienced except the lower daily flows of April 25-30; May 1-9, 15-19 and August 16, 22-24, 2009 and one higher daily flow on June 22 2009. Peak flow of 1300 cfs occurred at 0115 on June 23, 2009 at a gage height of 6.74 feet with a shift of 0.00 ft. It exceeded measurement No. 1039 taken the day before by 0.04 ft in stage.

Discharge.-- Shifting section control method was used for all periods of good record. Shifts are caused by scour and fill, vegetation and moss growth, and downstream channel constrictions. Shifts were applied as defined by measurements and were distributed by time with consideration to stage. Open water measurements showed shifts varying between -0.15 and 0.12 feet. All open water measurements were given full weight except for measurements 1037 and 1038 which were adjusted up to 5% to better fit curve distribution.

Special Computations.-- None .

Remarks.-- The record is considered good. Station maintained and record developed by Lee Cunning.

Recommendations.-- Measurements below 50 cfs are needed to validate the new rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06752500 CACHE LA POUDRE NEAR GREELEY

RATING TABLE--

CLAGRECO27 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

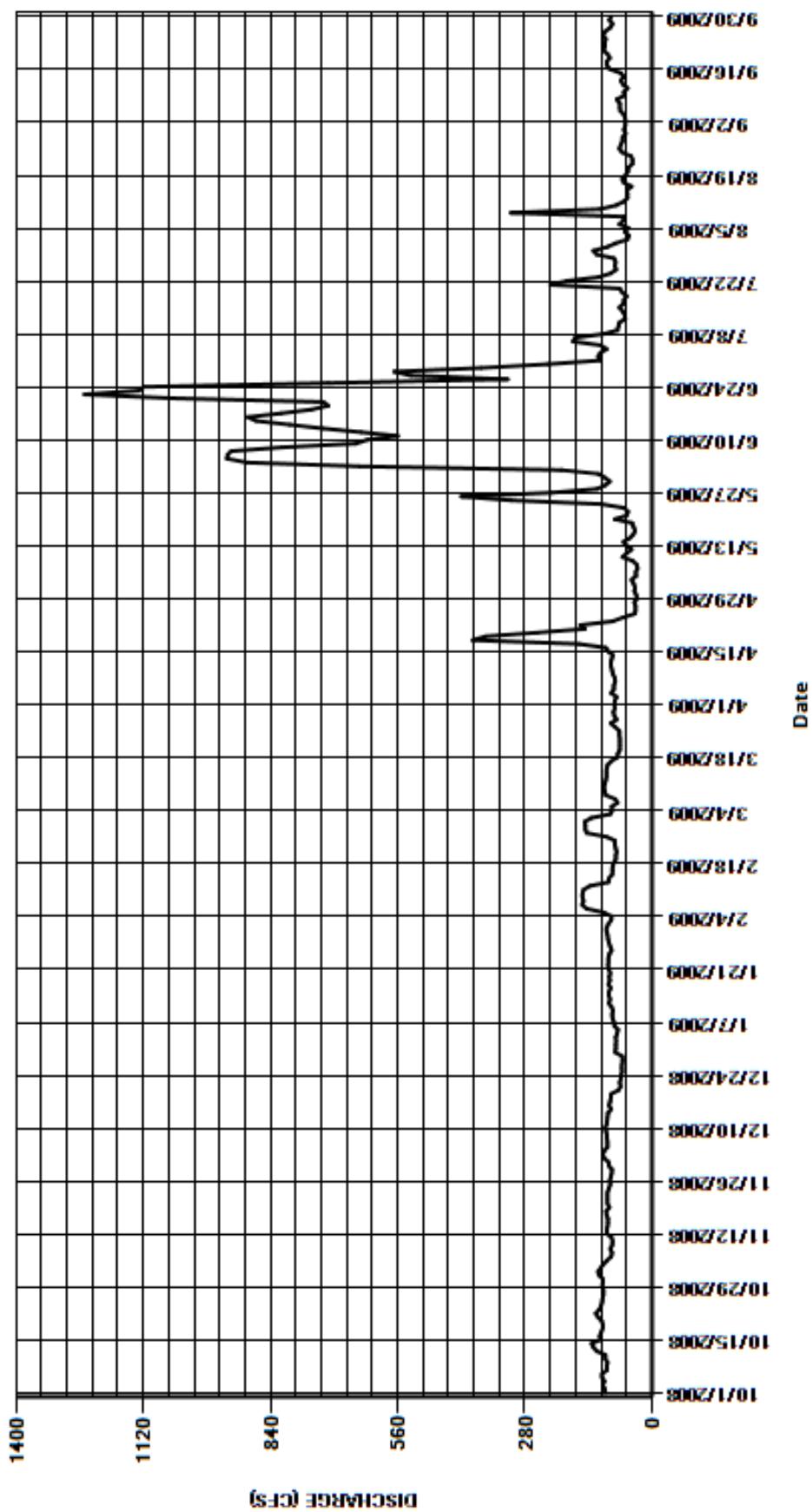
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	103	116	96	80	100	148	83	39	118	113	80	59
2	104	119	105	79	96	134	82	37	200	119	54	59
3	109	113	109	80	90	92	78	41	645	114	51	59
4	105	107	105	77	89	88	90	45	893	100	60	62
5	110	99	98	75	106	89	84	35	936	113	52	70
6	110	90	98	83	144	76	84	36	935	174	72	71
7	99	88	99	84	154	81	81	32	927	169	63	71
8	100	92	99	87	151	102	82	34	815	106	60	78
9	98	88	101	88	153	104	86	43	652	76	311	61
10	103	87	103	86	153	106	88	65	627	74	115	62
11	103	89	100	89	151	104	90	56	560	72	79	54
12	122	99	99	95	137	102	91	45	641	59	62	64
13	129	100	98	92	96	100	89	56	726	60	54	69
14	133	98	97	95	95	100	86	63	798	65	54	62
15	114	97	90	95	88	100	96	49	872	72	56	69
16	115	97	95	91	87	98	102	41	890	63	45	93
17	112	100	92	96	87	90	161	37	817	62	62	99
18	109	101	91	93	85	77	395	41	750	56	66	100
19	108	94	90	94	80	75	367	44	713	66	58	93
20	111	98	74	92	80	71	253	82	724	71	53	98
21	119	98	69	95	78	71	148	56	1060	224	52	107
22	124	98	71	97	80	71	158	53	1250	188	43	104
23	116	98	69	96	82	71	87	62	1130	118	43	104
24	112	95	68	96	82	72	64	112	1120	91	46	102
25	110	92	66	94	100	72	38	311	713	79	66	108
26	109	93	67	89	144	81	36	420	318	82	72	103
27	107	91	66	92	147	91	36	221	531	80	69	92
28	107	89	65	95	147	78	39	121	568	84	65	87
29	109	88	66	97	---	83	33	103	377	122	65	94
30	109	95	81	98	---	85	35	93	230	129	58	90
31	108	---	80	100	---	82	---	104	---	98	62	---
TOTAL	3427	2909	2707	2800	3082	2794	3242	2577	21536	3099	2148	2444
MEAN	111	97	87.3	90.3	110	90.1	108	83.1	718	100	69.3	81.5
AC-FT	6800	5770	5370	5550	6110	5540	6430	5110	42720	6150	4260	4850
MAX	133	119	109	100	154	148	395	420	1250	224	311	108
MIN	98	87	65	75	78	71	33	32	118	56	43	54
CAL YR	2008	TOTAL	33016	MEAN	90.2	MAX	927	MIN	27	AC-FT	65490	
WTR YR	2009	TOTAL	52765	MEAN	145	MAX	1250	MIN	32	AC-FT	104700	

MAX DISCH: 1300 CFS AT 01:15 ON Jun. 23,2009 GH 6.74 FT. SHIFT 0 FT.

MAX GH: 6.74 FT. AT 01:15 ON Jun. 23,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06752500 CACHE LAPOUDRE NEAR GREELEY
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
CACHE LA POUDRE RIVER AT GREELEY WASTEWATER PLANT
Water Year 2009

Location.-- Lat 40°25'21", Long 104°40'37" in SW ¼ section 4, T5N, R65W, Weld County. Just east of Greeley, on right bank, approximately 400 feet east of Highway 85, river mile 5.5.

Drainage and Period of Record.-- Not determined; 2007 to current year.

Equipment.-- Sutron SatLink2 DCP and satellite transmitter and a SDI-12 shaft encoder in a 7 ft x 7 ft exposed aggregate concrete shelter with a 48-in diameter concrete stilling well. The primary reference gage is an electric tape gage located in the shelter. There is no outside reference at this time. No outside reference at this time. The control is a hinged-crest gate with concrete abutments.

Hydrographic Conditions.-- The snow pack in the Cache la Poudre basin produced a runoff that was about normal at the Mouth of the Canyon gage.

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. The record is complete and reliable. The hinged-crest diversion gate on the control structure, located approximately 50 feet downstream of the gaging station, has remained in a completely lowered position since 14 March 2007. It has had no effect on the reported stage record.

Datum Corrections.-- No datum adjustments were made for the time period 1 October 2008 through 30 September 2009.

Rating.-- The control during low to moderate flows is a 60 ft x 7 ft hinged-crest gate with concrete abutments, located approximately 50 feet downstream from the gaging station. During high flow conditions, the control is the channel. Rating Table CLAWASCO06 was used for the entire year. It was developed using 56 measurements taken during Water Years 2006-09. This cross-section is typically subject to heavy Sago pond weed growth during late spring and summer. Fourteen measurements were made this year (Nos. 46 – 59), ranging in discharge from 52.2 cfs to 1369 cfs. The peak flow of 1380 cfs occurred at 0515 on June 22, 2009 at a gage-height of 4.98 feet with a shift of 0.00 feet.

Discharge.-- Large shifts at this gage are caused by thick vegetative growth, scour and fill of silt and mud, and movement of water around a sand bar that occasionally forms during low flow, just downstream of the control section. Control of the pond weed was attempted this past water year by raking the channel to dislodge the roots of the pond weed. While there was some growth of the pond weed both above and below the cross section, we were able to keep the cross section clear. All measurements taken during this period were used for this analysis. Between 15 July and 2 September (measurement Nos. 57 - 59) the overgrowth of the Sago pondweed is thought to have caused lower velocity readings. The rating curve will become more representative of this section as more records are collected. This will result in a more effective application of shifts. The cross section was first raked on 28 May 2009. Subsequent measurements: July 15 (No. 57), August 12 (No. 58), and September 2 (No. 59) were impacted by pond weed growth resulting in large negative shifts ranging from -0.15 ft on July 15, to -0.24 ft on August 12, to -0.36 ft on September 2.

Special Computations.-- Discharge exceeded the rating table (CLAWASCO05) June 20-25, 2009. The highest value on the table was 1060 cfs at 4.26 feet fo stage. During this period of time discharge reached a maximum gage height of 4.98 feet. Measurements were made on 4 June (No. 55: 920 cfs at 3.88 feet) and on 22 June (No. 56: 1369 cfs at 4.95 feet). The rating table was extended on 30 June 2009 (CLAWASCO06) to accommodate higher flows. A hydrograph is provided.

Remarks.-- The record is considered good. Station maintained and record developed by Greg Harp, City of Greeley Water Pollution Control Facility; record reviewed by Div I personnel.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CACHE LA POUDRE RIVER AT GREELEY WASTEWATER PLANT

RATING TABLE--

CLAWASCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

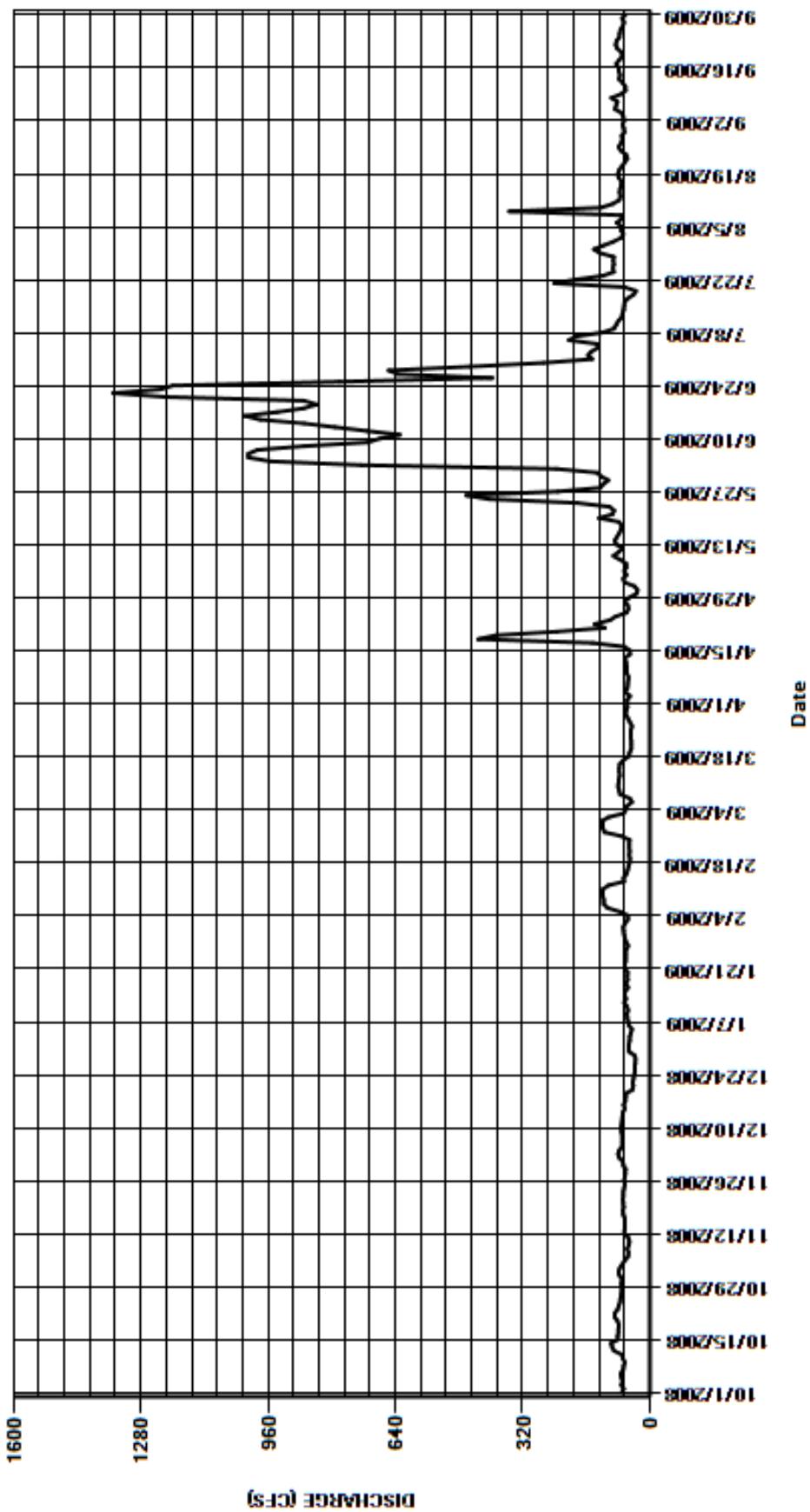
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	71	77	68	53	67	120	57	31	133	145	92	69
2	66	79	77	51	62	104	57	39	235	156	73	65
3	72	75	80	51	55	66	50	64	726	147	67	67
4	69	69	77	48	55	61	63	67	956	130	73	71
5	72	62	70	45	75	57	57	59	1010	133	71	88
6	74	55	70	53	106	45	56	65	1010	204	84	85
7	67	54	70	55	116	51	55	59	987	185	71	82
8	66	57	70	57	116	75	54	60	869	119	72	97
9	63	53	72	58	118	77	58	75	709	91	354	72
10	68	52	73	55	119	80	58	92	679	85	123	61
11	70	55	71	58	118	79	59	79	629	80	93	62
12	90	64	70	65	104	78	60	68	712	71	77	69
13	95	64	69	60	65	76	64	84	792	69	74	78
14	98	63	68	64	66	77	50	89	870	66	76	75
15	81	64	63	62	59	77	50	83	980	65	75	78
16	81	63	66	55	56	76	64	77	1020	64	72	79
17	79	67	62	61	54	67	144	73	937	56	72	85
18	79	68	61	56	51	54	432	71	871	41	79	77
19	78	66	60	57	50	51	389	78	838	35	80	70
20	82	67	44	56	52	47	234	128	870	64	77	71
21	89	68	42	63	51	47	113	94	1220	241	70	82
22	88	67	43	64	52	47	139	90	1350	185	63	86
23	81	67	41	61	52	48	101	102	1230	118	57	84
24	78	65	39	61	51	48	86	183	1200	91	60	77
25	75	63	38	61	73	48	59	404	781	93	73	76
26	74	65	38	60	114	45	54	462	396	91	79	74
27	72	63	37	55	118	50	56	232	634	92	73	68
28	71	62	36	60	118	55	64	125	657	91	69	65
29	72	61	38	63	---	60	52	117	453	126	71	70
30	72	67	52	65	---	60	34	105	268	141	64	61
31	70	---	54	66	---	57	---	123	---	117	66	---
TOTAL	2363	1922	1819	1799	2193	1983	2869	3478	24022	3392	2600	2244
MEAN	76.2	64.1	58.7	58	78.3	64	95.6	112	801	109	83.9	74.8
AC-FT	4690	3810	3610	3570	4350	3930	5690	6900	47650	6730	5160	4450
MAX	98	79	80	66	119	120	432	462	1350	241	354	97
MIN	63	52	36	45	50	45	34	31	133	35	57	61
CAL YR	2008	TOTAL	26460	MEAN	72.3	MAX	1070	MIN	26	AC-FT	52480	
WTR YR	2009	TOTAL	50684	MEAN	139	MAX	1350	MIN	31	AC-FT	100500	

MAX DISCH: 1380 CFS AT 05:15 ON Jun. 22,2009 GH 4.98 FT. SHIFT 0 FT.

MAX GH: 4.98 FT. AT 05:15 ON Jun. 22,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CACHE LAPOUDRE RIVER AT GREELEY WASTEWATER PLANT
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06754000 SOUTH PLATTE RIVER NEAR KERSEY
Water Year 2009

Location.--	Lat. 40°24'45", Long. 104°33'47", in NW 1/4 SW 1/4 sec. 9, T.5 N., R.64 W., Weld County, Hydrologic Unit 10190003, on downstream side of bridge on State Highway 37, 1.9 mi north of railroad in Kersey, and 2.5 mi downstream from Cache la Poudre River.
Drainage and Period of Record.--	9,659 mi ² . May 1901 to Dec. 1903, Mar. 1905 to current year. Monthly totals only for some periods. Periodic water-quality data available from 1950.
Equipment.--	A Sutron AccuBubble stage sensor equipped with a muffler-style orifice in the stream is hooked to a satellite monitoring DCP in a concrete block shelter. The old manometer with an orifice line running down a bridge pier was in place as a backup in 2009. (The manometer activated both a chart recorder and shaft encoder.) The DCP transmits 2 independent values for gage height. An outside wire weight is used for referencing both the AccuBubble and the manometer. A supplemental low water staff is installed on the closest pier. At the end of the 2009 water year, the manometer and land-line phone interface were both removed. The manometer was replaced with a Constant Flow Bubbler hooked to the same orifice line.
Hydrographic Conditions.--	Native water supply from the mountains is largely captured for agricultural and municipal uses before it reaches Kersey, but flows at Kersey will reflect general trends of drought or abundance. A significant portion of the total flow at Kersey comes from storm runoff in the summer months. The 25-year average for 1976-2000 is a yearly total of 914,000 acre-feet. Water Year 2009 saw 742,000 acre ft; so this was an average year.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data taken from the AccuBubble, except for October 1 to December 2, 2008 when the manometer data was used. The manometer seemed to be tracking better during this period. (Later in the year the manometer orifice line was damaged and the manometer readings were completely unreliable.) The AccuBubble data had some spikes occasionally, presumably due to sand dunes on the muffler. These spikes were assumed to be bad data. The spike hours were located by graphing the data, and hourly values were adjusted in the record as necessary. Calibration was maintained by about 100 wire weight readings made during measurements and visits to the gage. Twenty-six (26) corrections ranging from -0.10 to +0.02 ft were applied to the record. Only five of the corrections were greater than +/- 0.03 ft. Calibrating the bubbler is difficult since often the instantaneous readings can be affected by the sand on the orifice muffler. The corrections were arrived at by considering both the instantaneous value at the time the wire weight reading was made, and also the average value for the hour or hours bracketing the reading. The channel was ice-free during the winter. The record is complete and reliable, except for the following periods: August 29—September 3, 2009: when data spiking was severe.
Datum Corrections.--	Levels were last run on September 13, 2005 using B.M. #1 as base. The gage was found to be reading within the allowable limits. No changes were made.
Rating.--	Low water control is a channel constriction and sand channel bed immediately downstream from the gage about 150 ft where pilings exist on the left bank for an old bridge. During very low flow the channel bed is stable. Channel bed changes occur by time for sustained low and medium flows. A large peak will change the channel and result in a new pattern of shifts for lower flows. Brush and trees in the overflow areas cause backwater at high stages. Rating No. 22, used for 2007, 2008 and many years previous to 2006, was continued in use for 2009. (Rating 23 was only used for WY 2006.) Rating 22 is defined by measurements to 20000 cfs. Twenty-two measurements (Nos. 1011-1032) were made this year ranging in discharge from 281 to 6170 cfs. They cover the range in daily discharge experienced except the lower daily flows on April 12-16, July 17-20, and August 14-18; and higher daily flow on June 3 and 6. The peak discharge of 8040 cfs occurred at 1715 on June 3, 2009 at a gage height of 8.88 ft. with a shift of -0.31 ft. It exceeded measurement no.1023 made on April 19 by 1.00 ft in stage.
Discharge.--	Shifting control method was used. Shifts are caused by sand movement, vegetation, and the effects of the bridge piers. The channel was on the move in 2009. Shifts were applied using 3 variable stage-shift relationships for the year. Conceptually, the tables had a middle range in common, but differed on the high and low ends. Interestingly, the first and third tables had basically the same low end. Shifts were distributed as follows: Oct. 1—Dec 12, 2008: variable stage-shift table 1 was used. This table incorporated all measurements made during this period---Nos. 1011-1015 and No. 1009 and 1010 from WY2008. A portion of this table, including measurements 1011-1015 and also 1009 were used in variable stage-shift table 3. Measurements 1028, 1029 and 1032 made during the Table 3 period fit perfectly on the portion of Table 1 used in Table 3. For this reason, those later measurements (1028, 1029 and 1032) were incorporated into Table 1. Measurements 1011, 1012, 1013, and 1029 were adjusted up to 3% to better fit the table. Dec. 12—July 2, 2009: variable stage-shift table 2 was used. This table incorporated all measurements made during this period---Nos.1015-1027, as well as high water measurement 1008 made in 2008. All measurements were given full weight except for 1017 and 1019 which were adjusted up to 3% to fit the table. Begin and end dates for Table 2 were measurements. July 2—September 30, 2009: variable stage-shift table 3 was used. This table incorporated all measurements made during these periods---Nos.1027-1032. All measurements were give full weight except for No. 1029 which was adjusted 1% to fit the table. A portion of Table 1 was incorporated into Table 3. Table 3 extended lower than Table 1, since it was anchored on the low end by measurements 1031 and 1032 which described flows below what was experienced during the Table 1 period.
Special Computations.--	A hydrograph was plotted. Shift-adjusted ratings were developed from spreadsheet software tools new this year. Average daily gage heights without spikes derived from gage height plots for Aug. 28—Sept 3, 2009
Remarks.--	Record is rated as fair to good due to amount of variability in gage height corrections and the stage-shift tables. Station maintained and record developed by Bob Cooper .

Recommendations.--

A new rating should be created for 2010. For future reference, listed below are common issues with data at this gage. 1) Routine calibration: Differences between the instrument and the wire weight are not corrected until they have been observed to be consistent for several visits. If corrections are made every visit, then it is not uncommon to see compensating plus and minus corrections on successive visits. If this occurs, then record datum corrections must be distributed by assuming that some adjustments were made in error. 2) The Acububbler is subject to spiking or "painting" due to sand. Before recording an instrument reading when sand problems are suspected, it is wise to force a purge or do a more sustained air injection by keeping the instrument on "live reading". Rarely, the muffler is uncovered and visible from above on the bridge. It is useful to note this condition in visit remarks, as this eliminates sand as a problem. 3) Readings for storm peaks at this gage are problematic since higher water manifests as unsteady flow. (The pier staff can be observed to rise and fall several tenths of a foot in a few minutes). Presumably this is due to the variable resistance of vegetation in the high water channel. In the record data, it is not possible to distinguish whether a data spike is due to sand/painting or a legitimate reading of unsteady flow. For high water, the GH plot can be used to provide useful average GH's. During cable measurements, wire weight readings should be made every 15 minutes. .

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06754000 SOUTH PLATTE RIVER NEAR KERSEY

RATING TABLE--

PLAKERCO22 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

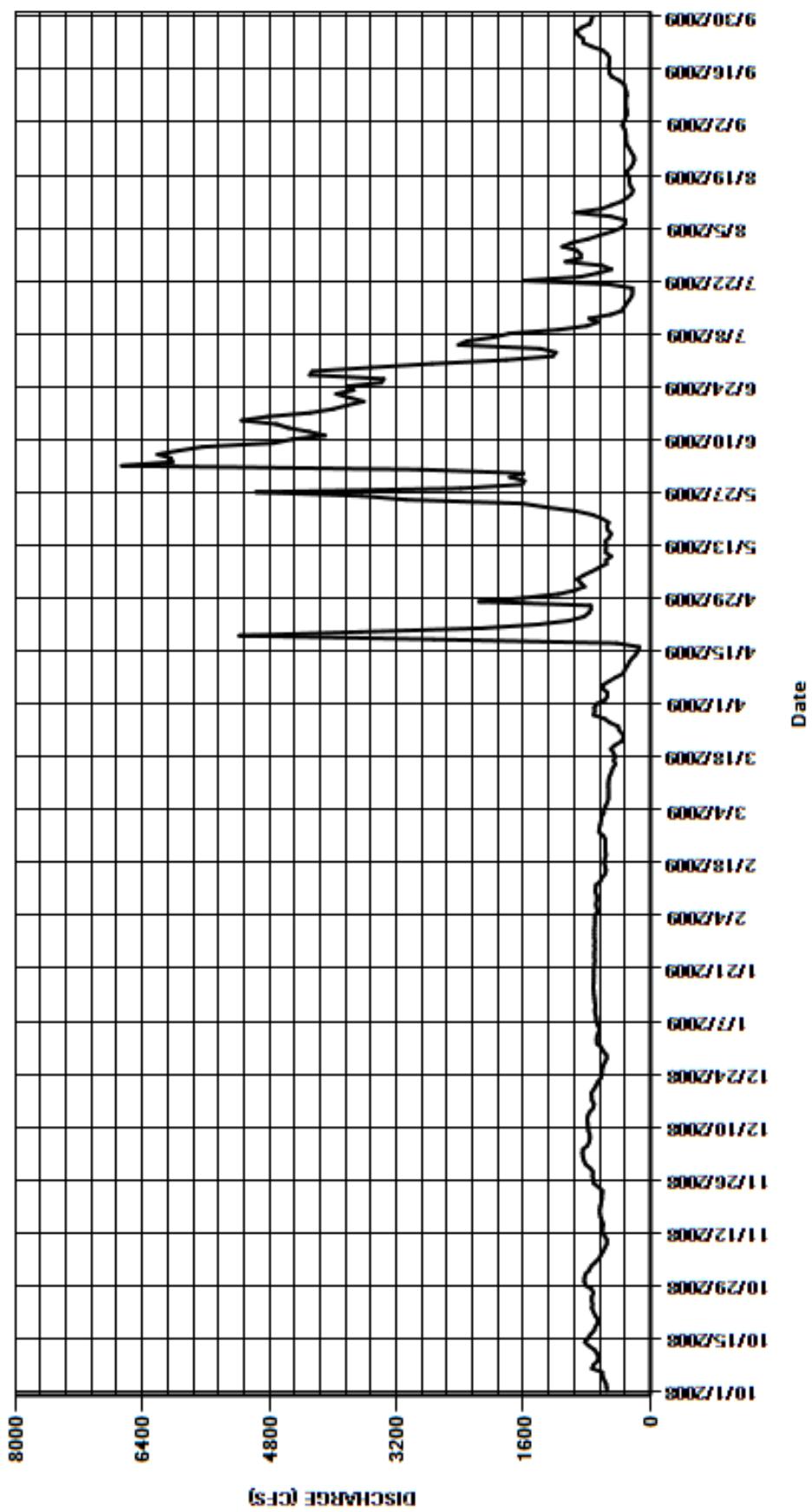
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	550	818	838	674	704	623	674	953	1600	1820	992	354
2	553	774	851	678	703	617	570	831	2910	1230	789	342
3	561	749	857	674	703	589	542	880	6660	1190	640	317
4	586	701	853	652	702	587	545	922	6020	1390	482	294
5	605	654	793	642	663	563	604	843	6040	2420	364	297
6	608	625	772	668	679	542	594	742	6210	2310	322	308
7	736	597	762	685	687	528	517	650	5940	1980	315	310
8	716	574	765	684	674	528	435	553	5640	1780	499	312
9	664	550	785	699	673	527	341	560	4750	1150	957	298
10	655	546	786	701	691	534	324	493	4510	800	618	305
11	674	577	791	691	692	530	289	562	4100	665	492	319
12	708	606	796	703	686	526	267	561	4300	772	362	331
13	777	608	788	706	631	510	232	556	4560	501	293	394
14	827	593	763	712	609	489	185	567	4710	362	236	487
15	787	611	720	716	570	474	158	520	5150	330	218	519
16	756	627	711	720	561	441	140	495	4830	300	253	521
17	712	637	737	716	572	464	422	538	4290	262	264	525
18	695	640	740	717	584	444	2730	548	4000	233	263	519
19	662	630	743	711	574	466	5180	528	3820	227	285	517
20	662	620	710	715	560	500	3640	611	3610	226	295	546
21	696	611	683	710	569	451	2120	729	3790	514	247	605
22	718	610	660	707	566	367	1410	943	3960	1600	220	742
23	737	604	623	702	571	341	1020	1310	3740	888	204	850
24	729	652	612	707	568	350	840	1620	3830	661	211	848
25	740	715	610	707	593	397	778	3080	3390	489	243	908
26	739	720	598	701	649	408	749	3640	3360	610	268	935
27	716	731	577	707	644	515	754	4970	4290	1070	299	869
28	741	723	552	700	633	576	2160	2390	4260	876	309	764
29	818	758	554	707	---	718	1590	1620	3520	877	312	745
30	833	815	595	708	---	703	1160	1590	2750	926	312	726
31	831	---	619	707	---	708	---	1770	---	1110	323	---
TOTAL	21792	19676	22244	21627	17711	16016	30970	36575	130540	29569	11887	15807
MEAN	703	656	718	698	633	517	1032	1180	4351	954	383	527
AC-FT	43220	39030	44120	42900	35130	31770	61430	72550	258900	58650	23580	31350
MAX	833	818	857	720	704	718	5180	4970	6660	2420	992	935
MIN	550	546	552	642	560	341	140	493	1600	226	204	294
CAL YR	2008	TOTAL	224534	MEAN	613	MAX	5820	MIN	149	AC-FT	445400	
WTR YR	2009	TOTAL	374414	MEAN	1026	MAX	6660	MIN	140	AC-FT	742700	

MAX DISCH: 8040 CFS AT 17:15 ON Jun. 03,2009 GH 8.88 FT. SHIFT -0.31 FT.

MAX GH: 8.88 FT. AT 17:15 ON Jun. 03,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06754000 SOUTH PLATTE RIVER NEAR KERSEY
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06758500 SOUTH PLATTE RIVER NEAR WELDONA
Water Year 2009

Location.--	Lat. 40°19'17", Long. 103°55'13", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, T.4 N., R.58 W., Morgan County, Hydrologic Unit 10190003, on left bank 875 ft downstream from bridge on State Highway 144, 2.8 mi southeast of Weldona, and 4.2 mi upstream from Bijou Creek.
Drainage and Period of Record.--	13,190 mi ² . October 1952 to current year.
Equipment.--	Graphic water-stage recorder and satellite monitoring equipment in a corrugated metal pipe and stilling well. The satellite equipment is a high data rate SatLink Logger with digital shaft encoder. An electric tape inside the station references the gage. There is no outside reference.
Hydrographic Conditions.--	Water year 2009 showed average water supply for the South Platte basin. The total at this gage was 374,034 acre-feet. The most severe drought year recently was 2002 with 166,100 acre-feet. The last high flow year, 1995, produced about 695,000 acre-feet. Water supply comes from runoff and irrigation return flows from the Front Range tributaries. Flow at the gage is heavily influenced by demands of water rights.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data taken from satellite monitoring with chart back up.. The record is complete and reliable, except for the following periods: December 15-19, when the encoder and chart floats were frozen or partly frozen in the well, this period considered missing record. December 19-31; -January 1, 2, 26-31; February 1, 2, when the river was frozen and the stage discharge relationship was affected by ice. April 10-17 when the well was isolated and flow was below inlets. Temporary staff installed and several readings taken throughout period. Encoder calibration was supported by 49 readings during the year. Three corrections were notable: February 4 (-0.11 ft) correction made due to encoder tape slippage during high fast rise on Jan 27 when the river froze. ; February 20 (+0.03 ft) and March 19 (+0.06 ft), corrections were made to compensate for oil leaking out of float cylinders.
Datum Corrections.--	Levels were not run this year. Levels were last run on September 13, 2005 using RM 5 as base. No correction was made as the reading was within allowable limits. In November, 2005, RM 5 was horizontally and vertically GPS surveyed for a CWCB project. From this information, the gage datum computes to be 4309.79 ft msl.
Rating.--	Section control is a shale outcrop about 100 ft below the gage. This shale ridge was exposed when the channel began to scour during the 2000-2004 drought years. It has proved to be a very effective control for low and medium flows. High flows have occasionally brought enough sand down the channel to cover up the shale, at which point the control is a channel constriction with a moving sand bed. In high water, the channel splits in two opposite the station. As flow increases it spreads out into brush and trees along the right or south bank, which is relatively flat. During ice periods, backwater arises from some point downstream. Flows high enough to submerge the shale control often occur when ice is melting and breaking up. At these times, the channel at the gage can be ice-free, but still have a degree of backwater from downstream conditions. Rating No. 19 was continued for 2009. It was created in 2006 and is defined by measurements from 78 to 16,300 cfs. Below 650 cfs, table 19 was created with 2006 measurements. The high water end was taken from an equation fit through historic points. It should be noted that Rating 19 was developed for scouring conditions at the gage which exposed the shale. Some sand has begun filling in the section this year, resulting in negative shifts at high flows. Nineteen measurements (290-308) were made this year, ranging in discharge from 62.3 to 3480 cfs. The measurements cover the range of discharge experienced during good record except for the higher daily flows of June 4-9, 14-17. Peak flow of 4590 cfs occurred at 1000 on June 7, 2009 at a gage height of 6.66 ft with a shift of -0.30 ft. It exceeded measurement No. 303 made on June 11 by 0.73 ft in stage.
Discharge.--	Shifting control method was used all year. The main shift mechanism was considered to be scour and fill of sand occurring over time. Shifts were applied as follows: October 1, 2008—April 10, 2009: shift distribution by time proration . April 10—May 13: variable stage shift table PLAWELOCSC1--- based on measurements 229-302 made during that period. May 13—June 11: variable stage shift table PLAWELOCSC2--- based on measurements 302-303 made during that period and 299 and 301 made previously. June 11—September 30: variable stage shift table PLAWELOCSC3--- based on measurements 303-309 made during that period, plus measurement 199 anchoring the low end. All measurements were given full weight.
Special Computations.--	Winter estimates at Weldona typically use a mass balance from either the Kersey gage (upstream) or the Fort Morgan (USGS) gage and/or the Balzac gage (downstream). A spreadsheet with gage flows and diversions is used to calculate a base flow that should exist at the gage. This base flow is compared to record periods to estimate the gain between upstream and downstream gages. This gain estimate is plugged back in to compute estimates for periods of bad record. In 2009 the mass balance was from the Balzac gage. The figure used for gain between Weldona and Balzac was 140 cfs, based on the 40 days preceding the ice period. The use of figures from Kersey or Balzac can involve some effort to account for travel time between the gages. This can be done by lagging the Kersey flow a day or by averaging succeeding daily flows at Balzac. A typical calculation would be: PLAWELOC = BALZAC (2 day average) + DIVERSIONS – GAIN. The spreadsheet precision should not be confused with accuracy. Estimates need to be rounded to at least the nearest 10 cfs. April 10-17 was estimated from staff readings made on April 10, 13, 14, & 17, and a measurement made on April 10.
Remarks.--	The record is good, except for the following days which are estimated and poor: December 15-January 2; January 26-February 2; April 10-17. Station maintained and record developed by Bob Cooper.
Recommendations.--	Install a permanent cantilever outside gage, and be alert for the gage getting beached in very low flows.

STATE OF COLORADO
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06758500 SOUTH PLATTE RIVER NEAR WELDONA

RATING TABLE--

PLAWELCO19 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

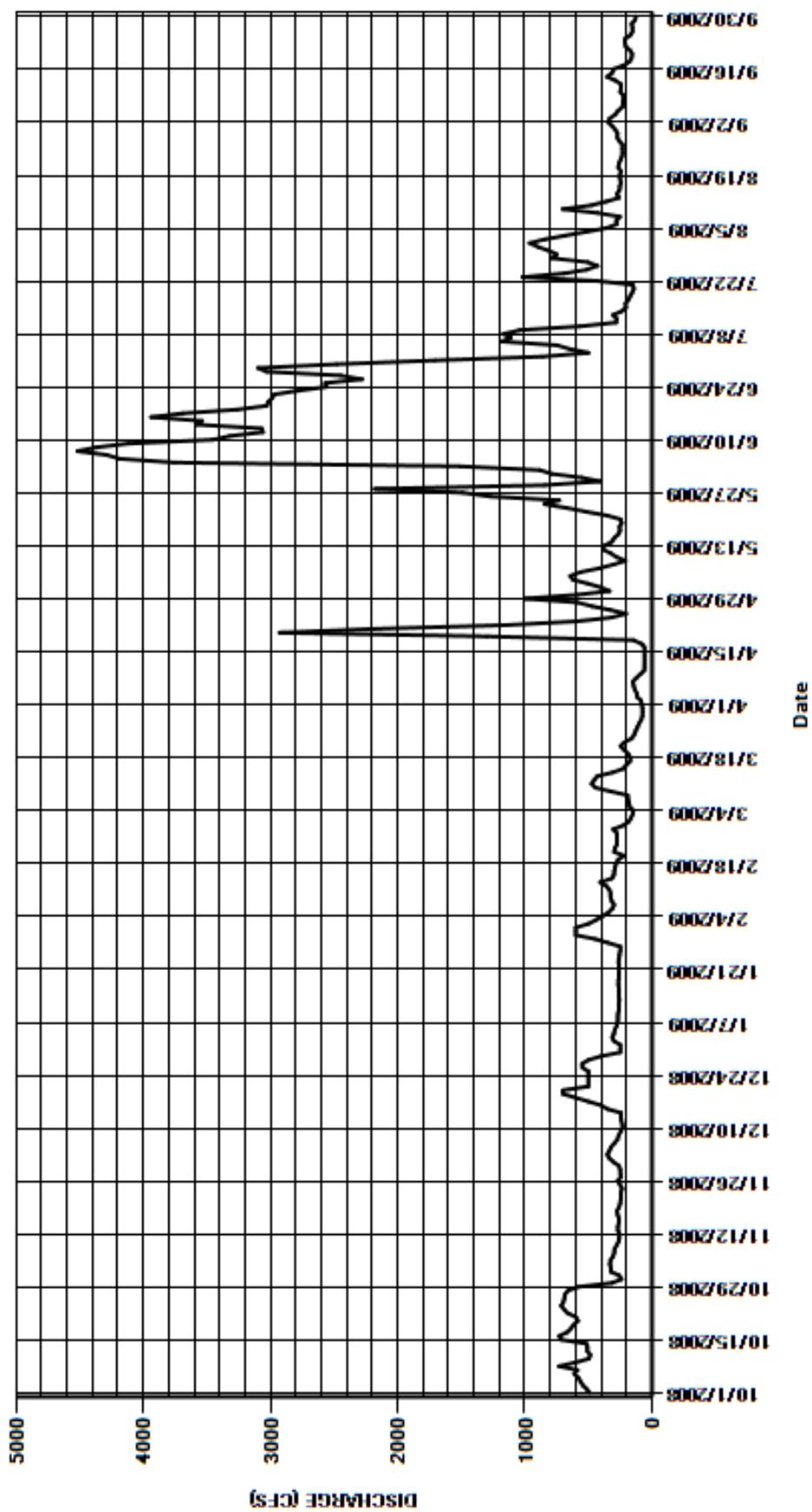
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	490	258	303	250	600	184	82	334	789	1710	963	315
2	516	325	336	300	500	165	86	404	884	861	843	346
3	545	324	351	313	442	153	117	508	1510	500	684	333
4	564	331	335	299	390	147	121	621	3760	646	518	289
5	580	328	321	294	344	178	137	644	4190	746	356	268
6	613	308	296	279	313	181	144	563	4290	1180	278	233
7	586	297	271	271	298	189	151	416	4520	1110	282	228
8	732	296	264	269	317	192	125	303	4370	1170	252	226
9	601	278	248	268	327	323	92	210	4120	1040	430	223
10	496	263	233	263	326	444	62	280	3460	566	704	250
11	486	258	235	262	335	475	60	326	3320	283	479	245
12	509	257	242	260	360	456	58	389	3060	278	360	243
13	508	268	245	258	408	432	58	374	3070	307	258	287
14	516	268	243	261	316	312	58	317	3580	238	277	354
15	715	261	350	261	299	227	58	298	3540	205	256	314
16	730	260	400	262	297	203	58	266	3940	209	253	305
17	666	270	500	265	290	173	80	251	3690	187	246	224
18	638	276	600	264	283	171	145	256	3260	172	251	177
19	615	261	700	261	266	190	1300	238	3030	155	253	161
20	583	251	700	262	219	220	2930	249	3020	143	245	156
21	599	247	500	261	299	248	2190	358	2990	152	265	173
22	662	246	500	261	292	217	1150	522	2970	430	261	207
23	691	245	500	264	276	161	594	675	2780	1020	248	212
24	714	236	500	259	275	141	318	847	2560	690	236	213
25	697	252	500	255	278	129	204	730	2570	512	232	171
26	690	270	550	250	277	115	330	1270	2280	429	235	153
27	684	245	550	250	306	101	474	1490	2450	508	232	153
28	661	250	500	350	227	84	588	2180	3030	786	257	161
29	578	250	400	450	---	76	1000	845	3100	748	275	135
30	316	261	250	600	---	75	590	405	2480	811	272	125
31	240	---	250	600	---	75	---	552	---	896	288	---
TOTAL	18221	8140	12173	9222	9160	6437	13360	17121	92613	18688	10989	6880
MEAN	588	271	393	297	327	208	445	552	3087	603	354	229
AC-FT	36140	16150	24150	18290	18170	12770	26500	33960	183700	37070	21800	13650
MAX	732	331	700	600	600	475	2930	2180	4520	1710	963	354
MIN	240	236	233	250	219	75	58	210	789	143	232	125

CAL YR	2008	TOTAL	132100	MEAN	361	MAX	2530	MIN	60	AC-FT	262000
WTR YR	2009	TOTAL	223004	MEAN	611	MAX	4520	MIN	58	AC-FT	442300

MAX DISCH: 4590 CFS AT 10:00 ON Jun. 07,2009 GH 6.66 FT. SHIFT -0.3 FT.
 MAX GH: 6.66 FT. AT 10:00 ON Jun. 07,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06758500 SOUTH PLATTE RIVER NEAR WELDONA
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC
Water Year 2009

Location.-- Lat 40°21'28", long 103°31'43", in SW¼NE¼ sec. 33, T.5 N., R.55 W., Morgan County, Hydrologic Unit 10190012, on bank 4.3 mi northeast of Snyder, and 0.7 mi downstream from North Sterling Canal.

Drainage and Period of Record.-- 16,623 mi². Oct. 1916 to present, prior to Oct. 1933: monthly discharge only.

Equipment.-- Graphic water stage recorder and satellite monitoring DCP in a concrete shelter with a concrete stilling well. The gage is referenced with an electric tape. There is a supplemental outside wire weight and a supplemental constant flow bubbler. The DCP is an 8210 utilizing a high data rate Satlink transmitter.

Hydrographic Conditions.-- The South Platte River near Balzac, CO is braided with heavily vegetated islands and banks. The channel at the current gaging site is divided by an island, a majority of the flow occurs on the North bank where the gage is located. In previous years the channel has been cutting towards the South, but turned North again after the June high water event. Much sand moves past the gage. Due to upstream senior calls on the South Platte during the irrigation season and North Sterling's call during the storage season, flows tend to remain low and somewhat controlled, except during storm events. As in previous years, the return flows continue to diminish as all available water above the gage gets diverted. The gage starts the reach of the South Platte River Compact. The legal importance is such that the gage is visited and flushed about every other day.

Gage-Height Record.-- The primary record is fifteen-minute data taken from satellite monitoring with chart and the Constant Flow Bubbler log as backup. The record is complete and reliable, except for the days discussed below when the inlets were partially plugged. The gage tends to stay open because the flow has spilled over the North Sterling diversion dam, ½ mile upstream, but will freeze over occasionally. The record tends to have spikes due to the diversion activities upstream, and the use of water pumped from the stilling well for flushing the inlets. The primary data is checked closely for bad values that might occur when the well has been briefly drawn down by the flush pump. A corrected value is inserted when this occurs. Also, when a small flush correction occurs, and it is obvious from the chart that only a few hours of plugged inlet occurred, then corrected values are inserted for these hours--without considering them to be estimates. This occurred on many days. Record had to be estimated on the following days when partially plugged inlets required a substantial GH correction: October 4, 9, 15, 20, 24, 27 30, 31, November 4, December 19, 20, 28, 29, January 28, February 2 -5, March 3, 7, 10, 18, 26, 27, April 9, 18, 24, May 8, 13, 22, 23, 25- 27, 30, 31, June 2, 3, 4, July 6, 11-15, 16, 23- 25, August 31 , September 19. The number of hours corrected varied between 3 and 10. Bubbler record was used on December 15-19, 23, 24, 31, January 1-8, and 31.

Datum Corrections.-- Levels were run on July, 27,2009. The elevation of the electric tape RP was found to be reading within the allowable limit of +/- 0.02 ft. The wire weight cable was replaced and the reading was adjusted -0.02 ft. The tape length was found to be 0.075 ft. too long. Before correction, the tape gage height = 3.02 ft, and after correcting the tape read 2.94 ft. Correction to the record was made using shifts for the measurement made that day.

Rating.-- The control is a shifting sand bottom with flow in several channels at low stages. Rating No. 3 in use since April 27, 1999 was used again this year. It is defined by measurements to 14, 650 cfs. Thirty measurements (Nos. 545 - 574) were made this year, ranging in discharge from 9.57 to 3220 cfs. They cover the range in discharge experienced except for the higher daily flows of June 5 -10, and 14-18. The peak flow of 5160 cfs occurred at 1230 on Jun. 14, 2009 at a gage height of 7.51 ft with a shift of -1.74 ft.

Discharge.-- Shifting control method was used all year. Shifts are caused by movement of sand released from the North Sterling diversion, and at larger flows by vegetation. There are groves of young willow and cottonwood trees growing in half of what used to be the bank full channel. Shifts were applied as defined by measurements and distributed by stage. Open water measurements show shifts varying between -1.74 ft and 0.06 ft. Shifts were applied using variable stage shift relationships for the entire year. Many tables were required. Stage shift table PLABALCOVST0901 was applied 0000 Oct 1 to 1007 Oct 30, and is based on Msmts 545 and 546 made during this time, and also No. 544 from WY 2007. Measurement 546, 570, 576, and 566 were used to define the higher end of the table. Msmt No. 545 was adjusted 1% to fit the table. Stage shift table PLABALCOVST0902 was applied 1100 Oct 30 to Dec 29, and is based on Msmt. Nos. 546-550, made during this period, as well as lower flow No. 545 and higher flow Msmts 570, 576, and 566. Msmts 547, 549, and 550 were adjusted 5%, -7% and -3% to fit the table. Stage shift table PLABALCOVST0903 was applied Dec 29 to Feb 3, and is based on Msmts 550-553 made during this period, as well as Nos. 545, 546, 570, 576, and 566, for the higher flows. Stage shift table PLABALCOVST0804 was applied Feb 3 to Mar 18 and is based on measurements made during the period, Nos. 553-556, plus measurements 545, 546, 570, 576, and 566, that were used previously and incorporated into this table. Measurement 555 was adjusted 4% to fit this table. Stage shift table PLABALCOVST0905 was applied on Mar 18 to Apr 21, and is based on Msmts 556-559 made during the period. Nos. 555, 553, 545, 546, 570, 576, and 566 were used previously and incorporated into this table. Measurements 565 and 564 were used to define the higher end of the table. Stage shift table PLABALCOVST0906 was applied Apr 21 to Jul 7, and is based on Msmt Nos. 559-566 made during the period. Msmts 561, 563, 565, and 566 were adjusted -1%, 2%, 4% and 3% respectively to fit the table. The table was extended to the peak gage height of 7.51 ft, with a -1.74 ft shift from Msmt 564. Stage shift table PLABALCOVST0907 was applied Jul 7 to 0900 Jul 27, and is based on Msmt Nos. 567-569a (before levels were run). Stage shift table PLABALCOVST0908 was applied from 1000 Jul 27 (after levels were run) to Aug 5, and is based on Msmts 569b and 570. Msmt Nos. 568, 576, 566, 559, 565, and 564 were used previously and were incorporated into this table. Stage shift table PLABALCOVST0909 was applied from Aug 5 to Aug 28, and is based on Msmt. Nos. 570-572 made during this period. Also used in this table were measurements 556, 566, 559, 565 and 564 from previous tables. Also included to define the higher end of the table is No. 576 made 10/26/2009. Msmt 571 was adjusted -3% and Msmt 572 was adjusted 2%. Stage shift table PLABALCOVST0910 was applied from Aug 28 to the end of the wate year, and is based on Msmts 572-574 made during this period. Also used were Nos. 554, 556, 572 ,571, and 566 which were used previously and Nos. 574 and 576 made in October of 2009.

Special Computations.--	Hourly gage heights for the days of plugged inlets or ice cover were estimated graphically on the chart. The new computed daily discharge was compared to the old discharge and depending on the percentage of change in discharge, the record was considered either good, fair or poor.
Remarks.--	Record is good, except for the following days with partially plugged inlets, which were fair to poor. These days are rated fair: October 3, December 29, January 28, March 26 and 27, April 18 and July 14. These days are considered totally estimated and poor: February 5, May 31, and July 11. Station maintained by Bob Erosky and record developed by Robert D. Erosky and Bob Cooper.
Recommendations.--	Graphs of the North Sterling diversion data would be sometimes helpful in estimating GH for periods of plugged inlets. A great deal of effort is required to get a good record at this gage due to the movement of large amounts of sand in the channel. Vigilant visits and measurements are a must.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC

RATING TABLE--

PLABALCO03 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

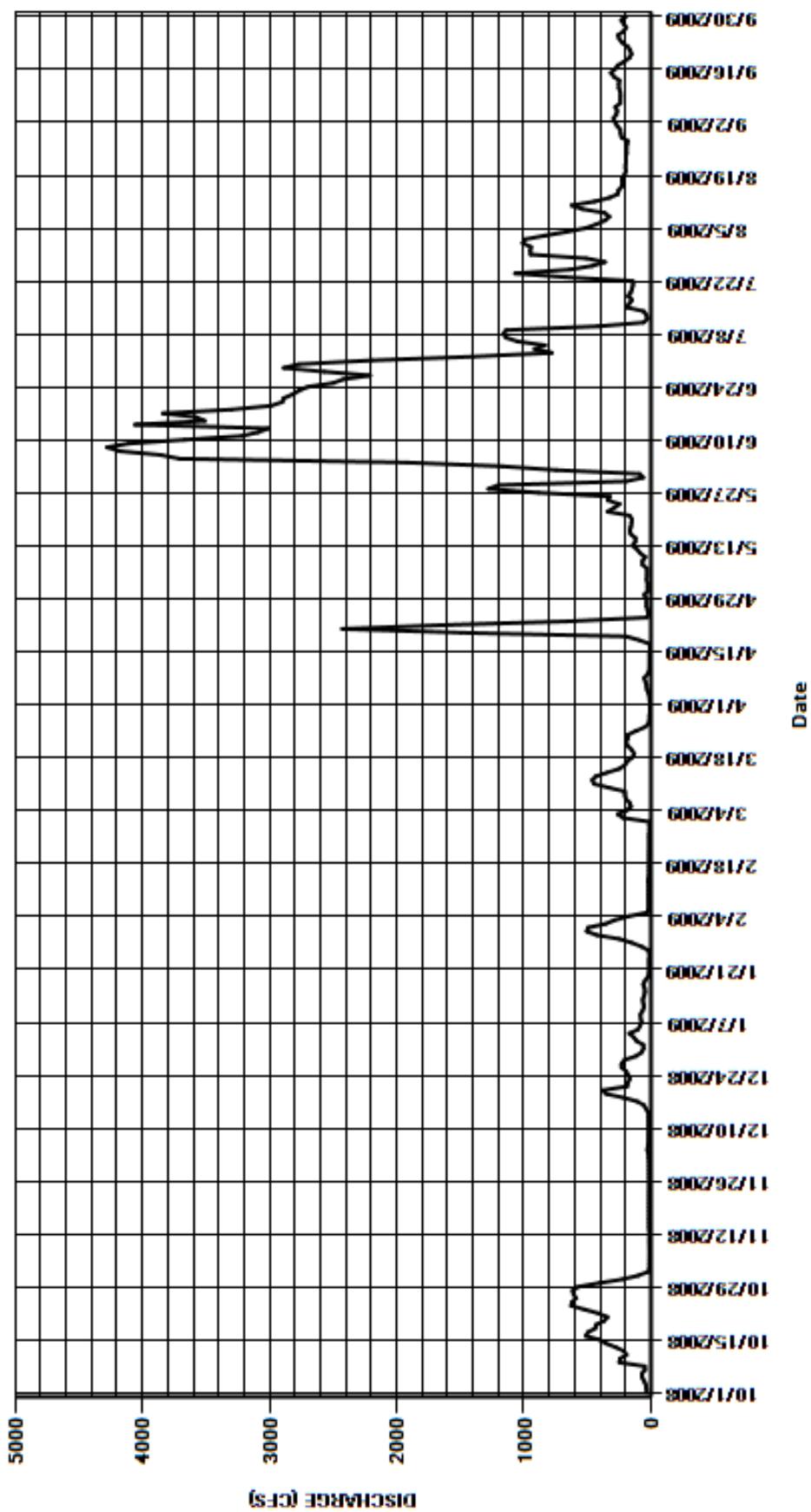
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	100	17	61	495	13	10	26	89	2200	1010	267
2	37	20	19	114	357	218	11	28	746	1400	995	283
3	40	14	19	136	286	262	12	28	1170	782	834	297
4	53	14	28	171	175	191	20	35	1920	917	663	273
5	69	12	26	105	29	159	33	33	3710	834	510	266
6	74	12	21	86	22	169	35	32	3860	1050	430	282
7	48	11	20	76	20	198	44	33	4180	1140	364	242
8	49	12	19	81	20	205	54	68	4280	1160	328	243
9	249	13	18	84	22	206	27	67	4110	1140	365	241
10	245	15	19	67	21	332	15	45	3670	417	539	242
11	192	14	19	56	20	448	12	85	3220	60	625	253
12	214	14	19	61	20	463	11	110	3090	29	445	255
13	277	15	20	66	23	435	11	145	3010	37	327	248
14	353	16	20	53	21	345	12	125	4060	58	261	291
15	405	16	39	48	17	249	11	122	3510	192	256	316
16	514	17	55	51	17	206	10	159	3580	172	230	285
17	496	16	107	62	17	187	11	168	3840	149	226	263
18	440	17	214	47	17	148	91	159	3300	180	228	210
19	431	17	352	24	16	132	195	154	2990	159	209	171
20	369	16	381	16	16	153	1500	151	2900	149	199	154
21	343	16	189	15	16	181	2430	171	2890	142	201	165
22	415	16	183	15	15	198	1650	343	2820	145	200	184
23	523	16	168	16	15	183	656	291	2770	673	199	226
24	628	15	179	15	15	182	32	247	2700	1070	197	250
25	622	15	196	14	16	118	20	342	2500	638	192	261
26	589	15	232	20	15	49	28	323	2420	463	194	217
27	610	17	232	76	14	17	37	887	2210	363	191	195
28	617	17	208	153	14	14	37	1280	2570	511	182	215
29	574	17	119	251	---	12	37	1200	2890	948	233	236
30	404	17	75	425	---	10	54	198	2770	950	239	194
31	224	---	60	506	---	10	---	62	---	945	242	---
TOTAL	10141	542	3273	2971	1751	5693	7106	7117	87775	19073	11314	7225
MEAN	327	18.1	106	95.8	62.5	184	237	230	2926	615	365	241
AC-FT	20110	1080	6490	5890	3470	11290	14090	14120	174100	37830	22440	14330
MAX	628	100	381	506	495	463	2430	1280	4280	2200	1010	316
MIN	37	11	17	14	14	10	10	26	89	29	182	154
CAL YR	2008	TOTAL	69619	MEAN	190	MAX	1880	MIN	11	AC-FT	138100	
WTR YR	2009	TOTAL	163981	MEAN	449	MAX	4280	MIN	10	AC-FT	325300	

MAX DISCH: 5160 CFS AT 12:30 ON Jun. 14,2009 GH 7.51 FT. SHIFT -1.74 FT.

MAX GH: 7.51 FT. AT 12:30 ON Jun. 14,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)

Water Year 2009

Location.--	Lat. 40°58'37", Long. 102°14'52", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T.12 N., R.44 W., Sedgwick County, on right bank of channel No 2 (right channel) 5 ft downstream from bridge on U.S. Highway 385, 0.9 mi southeast of Julesburg, 3.0 mi upstream from Colorado-Nebraska State line, and 8 mi downstream from Lodgepole Creek.
Drainage and Period of Record.--	23,821 mi ² . April 1902 to current year. Monthly data only for some periods. Published as near Julesburg and at Ovid in earlier years. Water quality data available from 1945 to 1995.
Equipment.--	Satellite monitoring DCP (Sutron 8210) are connected to an AccuBubble stage sensor. A wire weight gage on the bridge is used to reference the gage.
Hydrographic Conditions.--	The South Platte channel at Julesburg is braided. Channel 2 is one of 4 channels. The river is gaged on channels 1, 2, and 4, and a combined flow record is published for South Platte River at Julesburg. (The gage on Channel 4 was not functional in 2007 due to ponding conditions. GH's were not recorded at Channel 4 but a record was estimated. Channel 4 receives intermittent runoff from agriculture and storms, and in some years there is well augmentation water delivered down the channel.) Generally the river is dried up by diversions at many points upstream. Julesburg flow is usually comprised of return flows or water passed to Nebraska to meet Compact requirements (April 1- October 15, CRS: 37-65-101). During the winter, however, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry up locations occur. However, upstream diversions continue throughout the winter, except for periods of severe cold interrupting recharge and reservoir storage operations. Channels 1 and 2 split apart about 1/3 mile upstream from the gage and the proportion of water in Channel 1 has been increasing in recent years. At low flows, nearly all the flow is in Channel 1, with Channel 2 being dry. Channel 2 remained mostly dry for most of 2009, but did see flow in the summer months during a period of high flow in Channel 1. Flow did not get high enough in the winter of 2008-2009 to see any flow in Channel 2.
Gage-Height Record.--	The primary record is the hourly averages of 15-minute satellite data. The record is complete and reliable, except for the following periods. NO FLOW PERIODS: October 1, 2008—April 18, 2009, April 30—May 31, 2009, July 19—Sept. 30, 2009. Water was present at bubbler orifice to record a GH, but was ponded. No flow occurred. Generally the ponding GH was much less than when water flowed in the channel. During December 21—January 8 ice accumulated on the ponded water and raised the GH, but no flow occurred. "No flow" was confirmed by observations throughout this period. Included in this period were missing or partial record days April 16, 17, 18, 2009. These were known to be zero flow. During these "no flow" periods there was not a good connection between water ponded at the wire weight and water ponded at the orifice. Bubbler calibration was attempted but none of these adjustments were applied to the record, since the flow was zero. RECORD PERIODS: Many observations of zero flow were made. A GH of 4.40 was the highest observed zero flow, after a period when water ran in the channel. Discharge was computed for record above 4.40 by treating (4.40 ft, 0 cfs) as a measurement and computing a shift, and applying this shift either by time or stage throughout the year. No observations of near-zero flow were made, so near-zero discharges computed are estimates. During December 21—January 8 ice raised the ponded GH above 4.40. These days were shown as zero in the record even though a discharge could be computed as described above. Record is complete and reliable for the live flow periods, which were inferred (as above) to be: April 19-29 and June 1—July 18. Calibration was generally good. An initial correction of 0.09 ft was required for the flow period in June. This was likely due to attempts to calibrate the bubbler during the previous period of zero flow when there was not a good connection between the water at the wire weight and the orifice.
Datum Corrections.--	No levels was run in 2009. The wire weight was set by levels on April 10, 2004, after having been removed for bridge maintenance.
Rating.--	The control is the river channel which has historically exhibited scour and fill activity. Flow in the channel has been infrequent in recent years, resulting in marsh like conditions at the gage, without visible flow. Low flow control is also regularly confounded by grooved tracks of 4-wheel drive vehicles in the semi-dry channel just below the gage. Old rating No. 19 is still in use, albeit with large negative shifts due to channel growth and accretion in previous low flow years. Nine measurements (Nos. 369-377) were made by Colorado and Nebraska personnel this water year. They range in discharge from 19.5 to 884 cfs. In addition, an observation of zero flow gage height (made between the two periods of live flow) was recorded on the measurement summary. A shift was computed for this observation as if it was a measurement of zero discharge. The peak flow of 1350 cfs occurred at 0915 on June 12, 2009 at a gage height of 7.27 ft (gage height correction of +0.09 ft applied) with a shift of -1.18 ft. It exceeded measurement No.375, made June 26, 2009 by 0.60 ft. in stage. The instantaneous peak was 153 % of the highest measurement. The highest daily discharge (1300 cfs) was 147% of the high measurement.
Discharge.--	

Most shifts here are by backwatering caused by the constant and abundant vegetative growth in the channel during the last few dry years. In the old, clean channel, shifts were caused by the movement of sand. Shifts are also affected by the degree to which water spills into channels 3 and 4 which are not gaged, but which are included in measurements. Measurement shifts ranged from -0.54 to -1.19 ft. Shifts were distributed by a combination of time and stage proration. Measurements were adjusted to better fit the variable shifts and they were No: 374, 375, 376, 377. These measurements were adjusted from 6% to -13%. Measurements 371, 373-377 have the discharge from Channel 3 and 4 included in the measurements for real time flows. From Oct. 1-April 24: zero Flow observed, but a shift of -0.57, computed from the zero flow observation on April 30 was applied backward in time as a computational check. Flows were computed to exist during the ice period December 21—January 8, but these were zeroed out since zero flow and ice build-up in the pond were both observed. April 24-June 9, variable stage shift table PLAURCOVS01 was used for the rising hydrograph. The table used Measurements 369-373 made during this period and Nos. 376 & 377 made later.. The zero flow shift from Apr 30 was also used to define the low end. June 9-June 26, shifting by time using measurements 373-375 made during this period. June 26-July 19, variable stage shift table PLAJURCOVS02 was used for the falling hydrograph. Measurements 375-377 made during this period were used, as well as measurements 369-372 made earlier and the zero flow observation shift. July 20-Sept. 30, the zero flow shift was applied to the ponded GH's and discharge computations supported the observations of zero flow.

Special Computations.--

This record is added to the records from channels 1 and 4 to form the record for the South Platte River at Julesburg, combined flow. Measurements made at channel 2 include water found in channels 3 or 4. Channel 3 is not gaged. Channel 4 is no longer gaged, but a separate record is still maintained. Discharges can no longer be computed for channel 4 since a stage discharge relationship does not exist. However, the channel 4 record is now used to document small known inflows to Channel 4 area, including the Julesburg Town Effluent and Julesburg Town Return Ditch. So when river flow is high enough to spill into the channel 4 swamp, this water is incorporated into the channel 2 measurements and discharges. The channel 4 record is strictly used to account for small inflows for which we have records and which can become significant in a low-flow interstate compact discussion.

Remarks.--

The record is good except for the following near zero periods, which are estimated and poor: April 19-23, 28, 29; June 1-6; and July 15-19. No flow occurred in water year 2008, so the calendar year total is indeed zero. Station maintained and record developed by Devin Ridnour and Bob Cooper .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)

RATING TABLE--

PLAJURCO19 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

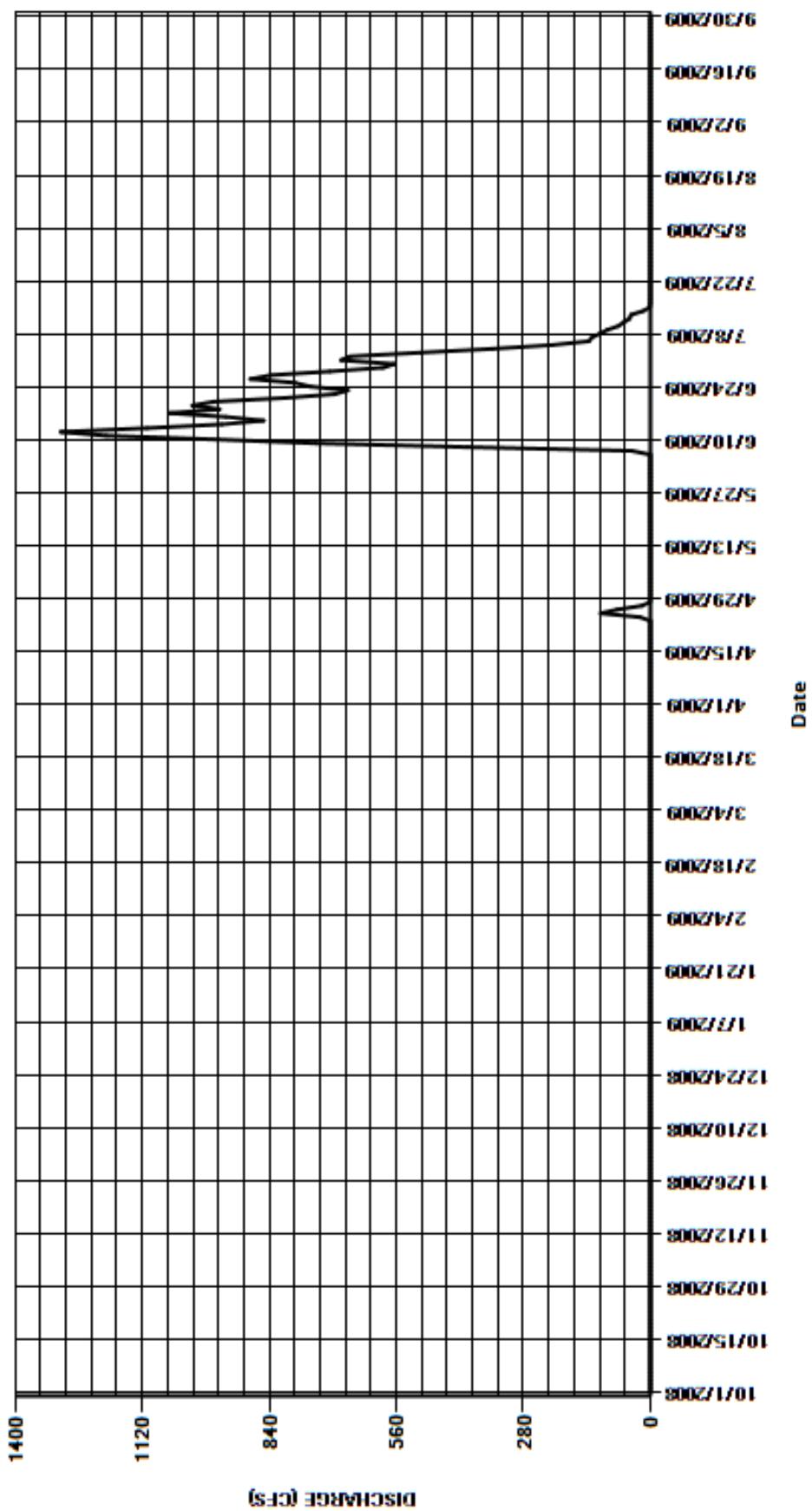
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0.11	682	0	0
2	0	0	0	0	0	0	0	0	0.22	662	0	0
3	0	0	0	0	0	0	0	0	0.02	506	0	0
4	0	0	0	0	0	0	0	0	0.02	348	0	0
5	0	0	0	0	0	0	0	0	0.1	217	0	0
6	0	0	0	0	0	0	0	0	0.24	136	0	0
7	0	0	0	0	0	0	0	0	41	129	0	0
8	0	0	0	0	0	0	0	0	404	112	0	0
9	0	0	0	0	0	0	0	0	738	95	0	0
10	0	0	0	0	0	0	0	0	954	71	0	0
11	0	0	0	0	0	0	0	0	1200	59	0	0
12	0	0	0	0	0	0	0	0	1300	46	0	0
13	0	0	0	0	0	0	0	0	1110	43	0	0
14	0	0	0	0	0	0	0	0	945	16	0	0
15	0	0	0	0	0	0	0	0	853	1.4	0	0
16	0	0	0	0	0	0	0	0	936	0.49	0	0
17	0	0	0	0	0	0	0	0	1060	0.18	0	0
18	0	0	0	0	0	0	0	0	950	0.01	0	0
19	0	0	0	0	0	0	0.23	0	1010	0	0	0
20	0	0	0	0	0	0	0.16	0	963	0	0	0
21	0	0	0	0	0	0	0.11	0	806	0	0	0
22	0	0	0	0	0	0	0.05	0	696	0	0	0
23	0	0	0	0	0	0	0.05	0	667	0	0	0
24	0	0	0	0	0	0	23	0	749	0	0	0
25	0	0	0	0	0	0	110	0	784	0	0	0
26	0	0	0	0	0	0	73	0	882	0	0	0
27	0	0	0	0	0	0	19	0	838	0	0	0
28	0	0	0	0	0	0	1.1	0	707	0	0	0
29	0	0	0	0	---	0	0.16	0	590	0	0	0
30	0	0	0	0	---	0	0	0	564	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	226.86	0.00	19747.71	3124.08	0.00	0.00
MEAN	0	0	0	0	0	0	7.56	0	658	101	0	0
AC-FT	0	0	0	0	0	0	450	0	39170	6200	0	0
MAX	0	0	0	0	0	0	110	0	1300	682	0	0
MIN	0	0	0	0	0	0	0	0	0.02	0	0	0
CAL YR	2008	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0	
WTR YR	2009	TOTAL	23098.65	MEAN	63.3	MAX	1300	MIN	0	AC-FT	45820	

MAX DISCH: 1350 CFS AT 09:15 ON Jun. 12,2009 GH 7.27 FT. SHIFT -1.18 FT. (GH CORR. OF +0.09 FT APPLIED)

MAX GH: 7.27 FT. AT 09:15 ON Jun. 12,2009 (GH CORR. OF +0.09 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)
Water Year 2009

Location.-- Lat. 40°58'37", Long. 102°14'52", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T.12 N., R.44 W., on Highway 385 bridge south of Julesburg CO.

Drainage and Period of Record.-- 23,821 mi². 1995 to current year.

Equipment.-- Satellite monitoring Data Collection Platform DCP (Sat Link 2) connected to a Sutron Constant Flow Bubbler (CFB) in a 4 ft x 6 ft prefab concrete shelter. A wire weight gage located on the bridge is the primary reference for the gage, with a supplemental staff located on the bridge pier closest to the shelter. The staff reads 1.17 ft lower than the wire weight, which occasionally leads to confusion. September 23, 2009, the Constant Flow Bubbler was replaced with a new CFB. The old CFB was not tracking well.

Hydrographic Conditions.-- The South Platte channel at Julesburg is braided. Channel 1 is one of 4 channels, which can contain flow. The river is gaged on channels 1, 2, and 4, and a combined flow record is published for South Platte River at Julesburg (PLAJUCCO). Channels 1 and 2 split apart about 1/3 mile upstream from the gage and the proportion of water in Channel 1 has been increasing in recent years. At low flows, 90-100% of the flow is in Channel 1, with Channels 2 and 3 being dry and the some local irrigation and storm runoff in channel 4. Channel 2 and Channel 3 will have water only at high flows. Generally the river is dried by multiple diversions upstream. Julesburg flow is usually comprised of return flows or water passed to Nebraska to meet Compact requirements (April 1- October 15, CRS: 37-65-101). However, during the winter, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry up locations occur. Upstream diversions continue throughout the winter, except for periods of severe cold interrupting recharge and reservoir storage operations.

Gage-Height Record.-- The primary record is hourly averages of 15-minute telemetered CFB data. The record is complete and reliable, except for the following periods: December 5, 2008, March 8, June 22-26, 28-30, July 8-14, 19-20, 2009, when there were short periods (1-4 hours) of intermittent missing data. Missing gage heights were interpolated between periods of good record with no loss of accuracy. December 12, 2008-January 1, 2009, January 4, 5, 10, 26-27, 2009, when the gage height was ice affected. September 18-30, 2009, when instrument calibration was questionable. Instrument calibration was supported by over 100 visits to the gage. From October to June, calibration remained good with only 5 adjustments to the instrument of 0.04 ft or less: October 30--November 4: a correction of -0.02 ft was prorated over time. The -0.02 ft correction was held from Nov 4 until the instrument was corrected on Nov. 11. December, 2-10: a correction of -0.03 feet was prorated over time. March 4-5: a correction of -0.01 feet was prorated over time. The -0.01 ft correction was held from March 5 until the instrument was corrected on March 18. May 26-June 1: a correction of -0.01 ft was prorated over time. The -0.01 ft was then further prorated to a -0.04 ft correction that was made on June 2. June 9-16, 2009 a correction of 0.04 feet was prorated over time. Calibration became problematic during the high water period in June when the wire weight gage became difficult to read. June 22-July 6: Inconsistent wire weight readings between personnel. An instrument adjustment of +0.08 ft. on June 23 was followed by an adjustment of -0.13 ft. on June 26. The June 23 adjustment was not made by a hydrographer and was assumed to be in error. A record correction of -0.08 ft was begun at the time of the first adjustment on June 23 and prorated to the -0.13 ft correction on June 26. A repeat of the above scenario happened when a +0.14 ft adjustment on June 30 was followed by a -0.12 ft adjustment on July 6. Again the +0.14 ft correction was assumed to be in error and a -0.14 ft record correction on June 30 was prorated to a -0.12 ft correction on July 6. The approach above is reasonable, but the record for June 22-July 6 will need to be downgraded to fair due to calibration questions. Following the high water, the instrument required progressive negative adjustments until December, 2009 (WY 2010) when the orifice line was replaced. During this period the procedure was to not make an instrument adjustment until the correction was observed for several visits in a row. August 4-25: an adjustment of -0.06 ft on August 11 was prorated back to zero on August 4, but an additional -0.02 ft was found to be needed. This -0.02 ft was prorated in jumps supported by visit readings (-0.02 ft on August 11, -0.02 ft on August 13, -0.04 ft on August 17) to a -0.17 ft adjustment made on August 25. September 10—October 5: a correction of -0.01 feet became progressively more negative until the instrument was adjusted -0.10 ft on October 5, 2009. The corrections were prorated in jumps supported by visit readings. (0.00 on Sept.1; -0.01 on Sept 10; -0.03 on Sept 15, 22, & 23; -0.05 on Sept 25 & 28; -0.07 on Sept. 29; -0.10 on Oct. 5).

Datum Corrections.-- Levels were run on April 24, 2009. Gage was found to read correctly.

Rating.-- The control is the river channel which exhibits scour and fill activity. An island in the channel about 200 ft. downstream can collect trash in higher flows and can affect the recorded stage values. Rating No. 06, in use since 2007 was continued this year. It is defined by measurements to 3740 cfs. Forty-one measurements (Nos. 561-601) were made by Colorado Division of Water Resources and Nebraska Department of Natural Resource (NDNR) personnel this water year. They ranged in discharge from 44.2 to 2420 cfs. The peak discharge of 2530 cfs occurred at 2200 on June 19, 2009 at a gage height of 8.03 with a shift of 0.26. It exceeded measurement No. 590 made by NDNR on June 22, 2009 by 110 cfs. The peak gage height of 8.25 ft occurred at 0915 on June 12, 2009.

Discharge.--

Shifting is primarily caused by constant movement of sand in the channel and by scour from high flow events. Shifts were distributed by a combination of time and stage as follows. Oct. 1-Feb. 4, shifts were distributed by time proration using Msmt. Nos. 561 -571. Feb. 4-Mar. 18, variable stage shift table ONEJURCOVS01 based on Msmt. Nos. 571-575 made during this period and Msmt Nos. 576-580 made later. Msmts 572 and 574 were adjusted 6% and 2% to fit the stage shift curve. Mar. 18-Mar. 25, shifts were distributed by time proration using Msmt. No. 575 and 576 . Mar. 25- Apr. 27, variable stage shift table ONEJURCOVS02 based on Msmt. Nos. 576-583. Apr. 27-Jun. 9, variable stage shift table ONEJURCOVS03 based on Msmt. Nos. 583-589 and measurements 579-582 made previously. The curve was extended down to the point GH= 2.57, shift = 0.01 to cover the range in stage. Msmt 585 and 588 were both adjusted 3% to fit the table. Jun. 9-Jun 22, shifts were distributed by time proration using Msmt. Nos. 589-590. A fairly large shift difference was documented by 3 measurements over a small range in stage. This forced a time distribution that included the peak for the year. However, the time-distributed peak discharge was within 3% of the computation using the possible highest stage shift. Jun. 22-26, shifts were distributed by time proration using Msmt. No. 590-591. These were the two highest measurements, made 4 days apart, and differing by only 40 cfs, Measurement 590 was adjusted 3% to make the shifts equal. Jun 26-Aug. 6, variable stage shift table ONJURCOVS04 based on Msmt. Nos.591-595. Table was run to a peak on August 6, between measurements 595 and 596. Measurement 594 was adjusted 1% to fit the table. Aug. 6-Oct. 1, variable stage shift table ONJURCOVS05 using Msmt. Nos. 596-601. Measurements 597, 598, and 601 were adjusted up to 2% to fit the table. The table was projected to GH = 4.50 and shift = 0.24 to cover the range in stage.

Special Computations.--

Discharge was estimated for ice affected days as follows: December 14, and January 1, 4, 5, 10, 26, 27 were estimated from partial gage heights. December 15-31 was estimated from adjacent record, temperature trends and measurement 568 made on December 30. A shift was inferred for Measurement 568 by using the GH of the first good GH record on January 1. This inferred shift was the same as the shift calculated from measurement 569 made on January 8. This allowed confidence in the shifts used January 2-8. This record is added to the records from channels 2 and 4 to form the record for the South Platte River at Julesburg, Combined flow.

Remarks.--

The record is good, except for the following periods: June 22—July 6. are fair due instrument calibration questions. December 14, 2008-January 1, 2009, January 4, 5, 10, 26, 27, 2009 are estimated and poor due to ice. Station maintained and record developed by Devin Ridnour and Bob Cooper .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)

RATING TABLE--

ONEJURCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

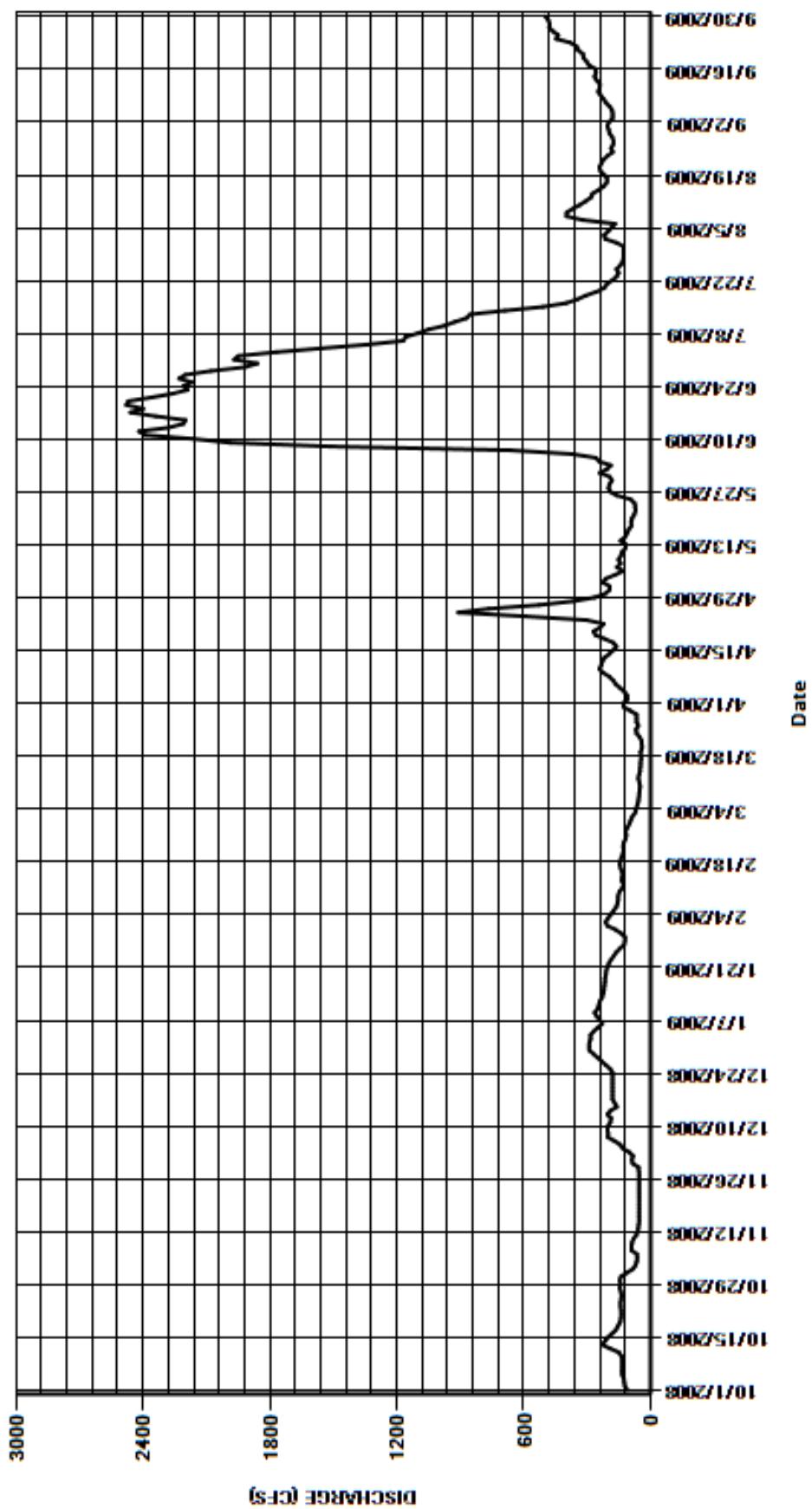
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	114	89	290	205	94	129	195	241	1970	162	205
2	122	85	83	284	213	86	110	195	206	1950	215	197
3	125	72	101	285	201	73	111	227	188	1770	220	179
4	127	66	132	270	189	69	124	211	243	1560	201	179
5	134	63	144	250	175	63	144	168	259	1340	184	182
6	136	65	172	229	162	58	165	129	372	1170	168	192
7	134	91	203	240	157	56	177	160	664	1160	320	210
8	134	91	201	255	153	54	195	142	1510	1100	398	222
9	134	88	205	265	153	52	224	152	1990	1050	397	236
10	139	82	200	250	148	50	242	141	2160	975	368	248
11	151	68	190	245	133	54	234	136	2390	926	335	241
12	193	61	187	240	128	58	229	120	2420	871	307	240
13	230	58	205	230	138	55	219	116	2280	854	282	255
14	215	56	190	225	134	50	196	143	2210	689	275	265
15	201	54	160	221	133	49	178	121	2200	509	245	259
16	181	55	170	219	141	48	162	112	2340	399	221	260
17	163	55	180	217	145	46	176	104	2460	346	207	292
18	154	54	180	216	145	45	216	91	2400	306	206	303
19	144	54	180	212	139	48	260	92	2480	256	220	318
20	141	54	180	210	132	41	271	88	2470	219	238	320
21	139	54	180	206	128	42	239	77	2360	208	242	343
22	140	55	180	198	130	43	222	72	2260	182	234	350
23	142	55	180	188	127	52	304	73	2190	161	223	380
24	143	55	180	174	119	67	591	76	2210	152	204	447
25	140	55	190	162	115	69	910	95	2170	162	179	438
26	138	55	210	145	119	58	765	160	2230	143	187	462
27	141	55	230	125	110	66	527	191	2200	132	177	480
28	146	56	250	122	101	66	364	199	2080	129	176	478
29	142	57	270	121	---	67	264	195	1920	128	182	484
30	146	85	290	140	---	97	214	183	1860	128	195	499
31	141	---	290	167	---	129	---	194	---	127	199	---
TOTAL	4626	1968	5802	6601	4073	1905	8162	4358	52963	21072	7367	9164
MEAN	149	65.6	187	213	145	61.5	272	141	1765	680	238	305
AC-FT	9180	3900	11510	13090	8080	3780	16190	8640	105100	41800	14610	18180
MAX	230	114	290	290	213	129	910	227	2480	1970	398	499
MIN	110	54	83	121	101	41	110	72	188	127	162	179
CAL YR	2008	TOTAL	49994	MEAN	137	MAX	470	MIN	21	AC-FT	99160	
WTR YR	2009	TOTAL	128061	MEAN	351	MAX	2480	MIN	41	AC-FT	254000	

MAX DISCH: 2530 CFS AT 22:00 ON Jun. 19,2009 GH 8.03 FT. SHIFT 0.26 FT.

MAX GH: 8.25 FT. AT 09:15 ON Jun. 12,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)

Water Year 2009

Location.--	Lat. 40°58'46", Long. 102°15'15", in NW 1/4 NE 1/4 sec. 33, T.12 N., R.44 W., Sedgwick County, Hydrologic Unit 10190018, on left bank of channel No 4 (left channel) 215 ft downstream from bridge on U.S. Highway 385, 0.9 mi southeast of Julesburg, 3.0 mi upstream from Colorado-Nebraska State line, and 8 mi downstream from Lodgepole Creek.
Drainage and Period of Record.--	23,821 mi ² .
Equipment.--	Metal pipe shelter and well. Supplemental outside chain gage. No recording equipment. (GH record was not kept in 2009.) An SDR datalogger is being stored for this location and can be installed if conditions warrant.
Hydrographic Conditions.--	Channel 4, the furthest channel to the North, splits off Channel 2 somewhere upstream from the point where Channel 1 splits from Channel 2. During the drought years 2000-2004, channel 4 filled with vegetation and became swampy. It is no longer possible to operate a stream gage in channel 4. When flows in the river upstream reach around 2000 cfs, some water is dumped into the channel, but there is not enough of a stage-discharge relationship for a gage to work. We are lucky to even find a spot where measurement is possible. Any river water measured in Channel 4 is included in the measurement for Channel 2. The State of Colorado is obliged to keep a record of flow in this channel for the South Platte River Compact with Nebraska. Presently at Compact level (120 cfs), no flow from the main river is in Channel 4-- but some base flow exists from seepage and local runoff sources. The record at Channel 4 estimates these base flows, and allows any real river water (as above) to be included in the Channel 2 record. These base flows are usually insignificant to the total river at high flows, but can become a significant percentage of the total in a dry summer. These non-measurable base flows are estimated by combining two administrative records—The Town of Julesburg Return ditch and the Julesburg Sewer plant discharge. The Town return ditch contains much—but not all—of the local runoff, occasional irrigation return flows, and some well augmentation water. It is active during the irrigation season, but is dry in the winter months except for an occasional day or two of storm runoff.
Gage-Height Record.--	The old gage still exists but has no equipment and no gage height record was collected this year. The gage was ponded for the base flows. A visit log is still kept at the old gage, but contains only observations of "ponded"-- as made by Colorado and Nebraska. These observations are not retained.
Datum Corrections.--	Levels were last run to inside gage on October 20, 2005 using No. 1 as base. The gage was found to be reading correctly.
Rating.--	The gaging area of the channel is totally clogged with mud and weeds. Vegetative growth downstream causes variable backwater for base flow, but seems to act as an ephemeral control for higher flows. Also the deposition of mud in the summer from the Julesburg Return Ditch causes much variation in the channel bed elevation and point of zero flow. Presently water measured in channel 4 (when flows are high in the total river) is included in Channel 2 computations. The most recent rating, No. 22, is dated December 27, 2000, and is defined by measurements to 5,000 cfs. Rating 22 was last used to compute record in 2005.
Discharge.--	Measurements made on Channel 4 are no longer used for record purposes. Discharge for the non-measurable base flow was estimated for the entire year in the following manner: Administrative record from the Julesburg return ditch was added to the flows recorded for the Julesburg Sewer Plant effluent. Both these records are based on measurement structures and can be considered fair data. However, they would not be a good representation of the flow at the channel 4 gage in rainy weather. During storm runoff the Town Return Ditch contains the "flashiest" portion of local runoff to the gage, being only about 700 ft away. Other local runoff gets dispersed by the weeds and ponding and filters down more slowly. But it is fair to say that when we are seeing runoff coming down the Return Ditch, we are likely missing some other water that is not measurable. So the estimates being made for base flow in channel 4 are likely low and need to be considered poor.
Special Computations.--	A spreadsheet was used to add the flows from the Sewer Plant and the Return Ditch. This record is added to the daily flows of channels 1 and 2 to form the record for the South Platte River at Julesburg, Combined flow.
Remarks.--	The record is estimated and poor. The gage is no longer operated due to lack of a stage-discharge relationship. Record contains estimates for unmeasurable base flows from local sources. Station maintained and record developed by Devin Ridnour.
Recommendations.--	The channel 4 gage could be reestablished (for a while) if a machine is used to clear the channel of vegetation and a bubbler instrument installed . Stilling wells have never worked well at this location.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

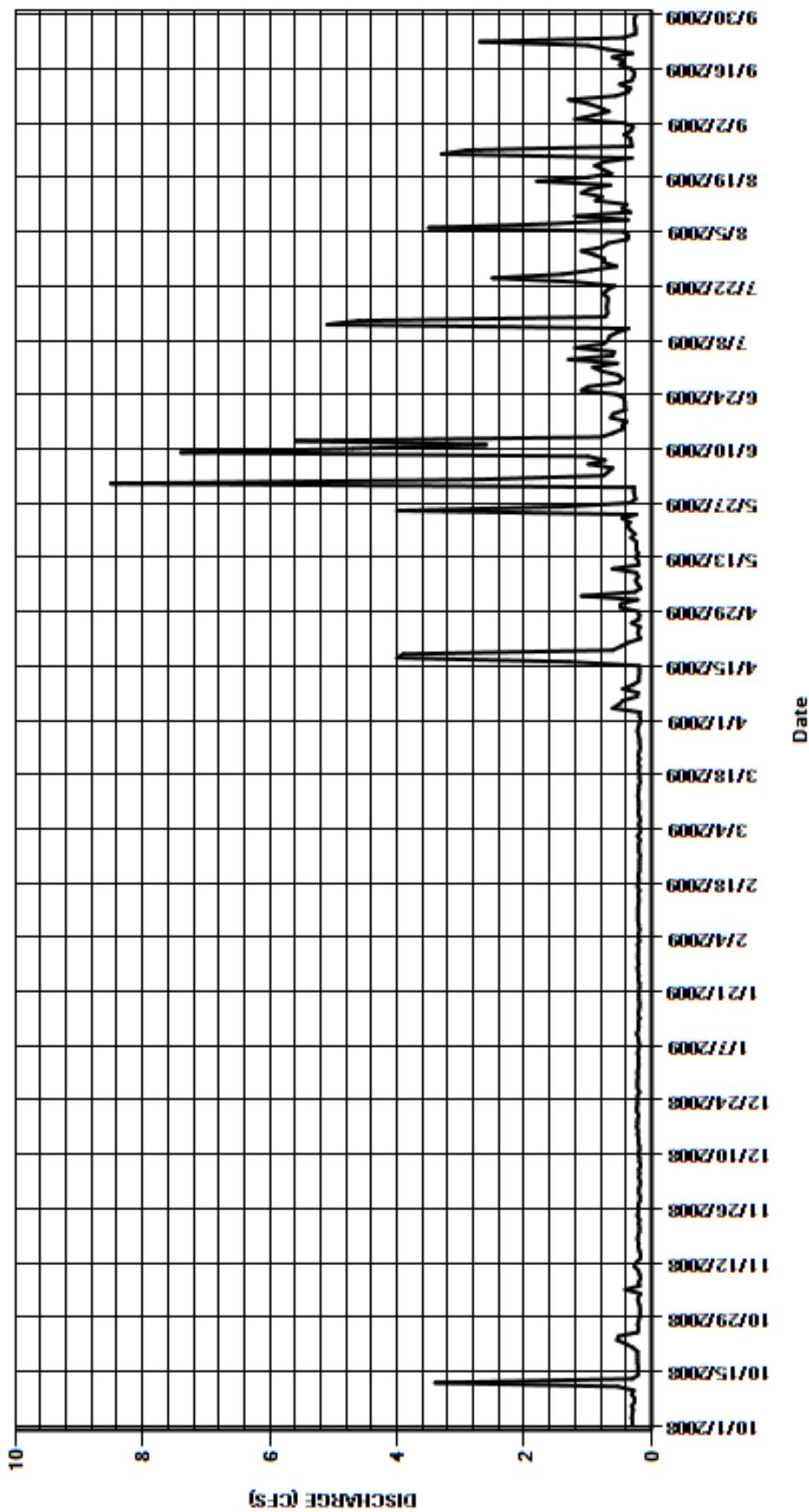
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.3	0.19	0.2	0.21	0.2	0.18	0.17	0.48	8.5	0.92	0.77	0.29
2	0.3	0.21	0.18	0.2	0.22	0.22	0.19	0.22	2.8	0.54	0.69	0.42
3	0.31	0.21	0.18	0.21	0.19	0.18	0.18	1.1	0.76	1.3	0.38	1.2
4	0.3	0.17	0.2	0.2	0.21	0.18	0.61	0.26	0.68	0.61	0.36	0.91
5	0.29	0.41	0.19	0.22	0.2	0.2	0.51	0.17	0.61	0.59	0.45	0.67
6	0.31	0.19	0.2	0.2	0.19	0.18	0.45	0.22	0.99	1.2	3.5	0.81
7	0.27	0.2	0.17	0.19	0.2	0.19	0.23	0.25	0.73	0.76	1.6	1
8	0.27	0.17	0.19	0.2	0.21	0.21	0.21	0.21	1	0.68	0.37	1.3
9	0.31	0.19	0.19	0.21	0.21	0.2	0.45	0.24	7.4	0.66	1.2	0.56
10	0.28	0.21	0.21	0.23	0.21	0.2	0.3	0.61	4.7	0.54	0.33	0.37
11	0.53	0.27	0.19	0.21	0.21	0.2	0.2	0.2	2.6	0.36	0.46	0.33
12	3.4	0.24	0.19	0.2	0.21	0.21	0.2	0.21	5.6	5.1	0.39	0.5
13	0.3	0.18	0.21	0.21	0.2	0.21	0.19	0.25	0.79	4.6	0.88	0.31
14	0.21	0.17	0.2	0.19	0.2	0.2	0.19	0.21	0.61	0.73	0.78	0.28
15	0.21	0.19	0.22	0.21	0.21	0.2	0.19	0.24	0.46	0.69	1.1	0.27
16	0.21	0.21	0.21	0.2	0.19	0.18	1.3	0.24	0.46	0.7	0.97	0.32
17	0.22	0.2	0.23	0.19	0.22	0.19	4	0.24	0.39	0.7	0.65	0.5
18	0.22	0.22	0.22	0.19	0.2	0.19	3.9	0.32	0.64	0.69	1.8	0.43
19	0.22	0.21	0.22	0.2	0.2	0.2	0.61	0.26	0.6	0.69	1	0.61
20	0.22	0.19	0.2	0.2	0.21	0.19	0.48	0.33	0.41	0.76	0.63	0.3
21	0.29	0.19	0.23	0.2	0.19	0.21	0.36	0.38	0.42	0.69	0.76	0.68
22	0.4	0.2	0.23	0.19	0.19	0.19	0.17	0.34	0.42	0.58	0.89	1
23	0.54	0.19	0.22	0.19	0.19	0.21	0.21	0.46	0.43	1.2	0.74	2.7
24	0.52	0.22	0.22	0.21	0.19	0.19	0.21	0.24	0.55	2.5	0.31	0.45
25	0.22	0.21	0.22	0.2	0.18	0.18	0.18	4	1.1	1.4	3.3	0.25
26	0.2	0.2	0.19	0.21	0.2	0.19	0.31	1.4	1	0.95	2.9	0.25
27	0.22	0.21	0.22	0.22	0.2	0.19	0.2	0.34	0.51	0.55	0.31	0.26
28	0.2	0.18	0.22	0.2	0.2	0.2	0.19	0.25	0.46	0.74	0.32	0.27
29	0.19	0.18	0.22	0.21	---	0.22	0.21	0.27	0.52	0.74	0.33	0.27
30	0.18	0.2	0.21	0.21	---	0.21	0.49	0.28	0.79	0.9	0.43	0.24
31	0.18	---	0.22	0.21	---	0.19	---	0.27	---	1.1	0.32	---
TOTAL	11.82	6.21	6.40	6.32	5.63	6.09	17.09	14.49	46.93	34.17	28.92	17.75
MEAN	0.38	0.21	0.21	0.2	0.2	0.2	0.57	0.47	1.56	1.1	0.93	0.59
AC-FT	23	12	13	13	11	12	34	29	93	68	57	35
MAX	3.4	0.41	0.23	0.23	0.22	0.22	4	4	8.5	5.1	3.5	2.7
MIN	0.18	0.17	0.17	0.19	0.18	0.18	0.17	0.17	0.39	0.36	0.31	0.24
CAL YR	2008	TOTAL	158.86	MEAN	0.43	MAX	6	MIN	0.16	AC-FT	315	
WTR YR	2009	TOTAL	201.82	MEAN	0.55	MAX	8.5	MIN	0.17	AC-FT	400	

MAX DISCH: NOT DETERMINED
MAX GH: FT. NOT DETERMINED

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)
Water Year 2009

Location.-- Lat 40°58'37", long 102°14'52", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T.12 N., R.44 W., on Highway 385 bridge south of Julesburg CO.

Drainage and Period of Record.-- 23,821 mi². Apr. 1902 to present. Monthly discharge for some periods published in USGS WSP 1310.

Equipment.-- Combined record is from South Platte River at Julesburg Channel 2, Channel 1, and Channel 4 records. See individual records for these channels for descriptions of gage equipment.

Hydrographic Conditions.-- In 2009, Channel 2 had water in it during high flows. Channel 4 had small amount of base flow during very high flows in Channel 1, along with some local augmentation and storm water in the spring and summer. All flow from points upstream was computed in Channels 1 and 2. The Channel 4 gage was abandoned in 2006 due to swampy conditions. Channel 4 flows in 2009 were estimated by combining administrative records for the Town of Julesburg sewer plant, and the Town of Julesburg Return Ditch. Both of these locations have recorders and measurement devices and the records have at least fair accuracy. Channel 4 estimates are considered poor since a certain amount of accretion in the channel will be missed, particularly during rainy weather. When there was live, measurable water from the river it was added to Channel 2 records.

Gage-Height Record.-- See individual records for analyses of gage height record.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- **DAILY FLOWS**— Combined daily flows are computed by inserting the mean daily flows for Channels 1, 2, and 4 into a spreadsheet and adding the totals day-by-day. The record spreadsheet was then used to generate the standard file of combined daily flows and the annual summary. **PEAK DISCHARGE**—Peak discharge occurs as a Combined Flow and this combined flow peak may or may not correspond to the peak discharges on the individual channel records. (In 2009, the combined flow peak corresponded to the channel 2 peak, but not the channel 1 peak-- due to shift distribution). At present the CDWR records program is based on hourly computation of discharge. Finding the peak for the 15-minute data at a gage with multiple records requires a special procedure. Normally, the day of peak discharge can be determined from inspection of hydrograph. If flow is contained in Channel One, then the Channel One peak can be used. When flow is being recorded in multiple channels, then hourly discharges for the peak flow period need to be entered in a spreadsheet for Channels 1 and 2. Then an hourly combined peak discharge is determined by inspection. 15-minute data within the peak hour is collated and discharges are hand-computed and entered on a spreadsheet. The 15-minute peak is then determined by inspection. Daily flow estimated to have been in Channel 4 on the peak day is added to the combination of 1 and 2. The peak is listed using Channel 1 GH, but without a shift. The above procedure was carried out in a spreadsheet and the peak flow was 3860 cfs on June 12, 2009 at 09:15, at a Channel One GH of 8.25 ft. **MAXIMUM GH**—This is determined from Channel One. Due to shift distributions, this may not be the Channel 1 GH corresponding to combined flow peak discharge. In 2009, the maximum Channel 1 GH occurred June 12, 2009 at 09:15 with a value of 8.25 ft. **ESTIMATED DAYS**-- If an estimate for either Channel 1, 2 or 4 contributes more than 10% of the total flow for a particular day, then the combined flow is considered estimated for that day. Estimated days for each channel are flagged in the combined flow calculation spreadsheet. Days with more than 10% of the total being estimates were determined by inspection. In 2009, the following days were estimated: Channel 1: December 5–January 1; January 4–5, 10, 26–27. The following days rated fair in Channel 1 are fair in the combined flow: June 22–July 6, 2009. In 2009, estimates on Channel 1 were made from partial record, visit readings, and measurements. During the ice period, an ice-free (combined flow) channel section about 4 miles upstream was located in the Pony Express State Wildlife Area. One measurement was made there in 2009. In the future it may be possible to base our ice estimates entirely on measurements.

Special Computations.-- A number of special calculations may be needed each year: Spreadsheets to compute combined flow and flag estimated days (always used.) . A peak discharge calculation spreadsheet , as discussed above (used in 2009). Winter estimates using mass balances involving our upstream gage at Balzac (not required for 2009). Winter hydrographs using trends from a downstream gage—South Platte River at Roscoe, Nebraska (not required in 2009).

Remarks.-- The combined flow record is good, except December 5–January 1; January 4–5, 10, 26–27 are estimated and poor; and, June 22–July 6, 2009 are fair, either because the Channel 1 record was fair, or one of the other channels had a significant estimated flow: . In 2009, about 85% of the combined flow was in Channel 1; 15% was in Channel 2; and 0.1% was in Channel 4. Record developed by Devin Ridhour and Bob Cooper .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

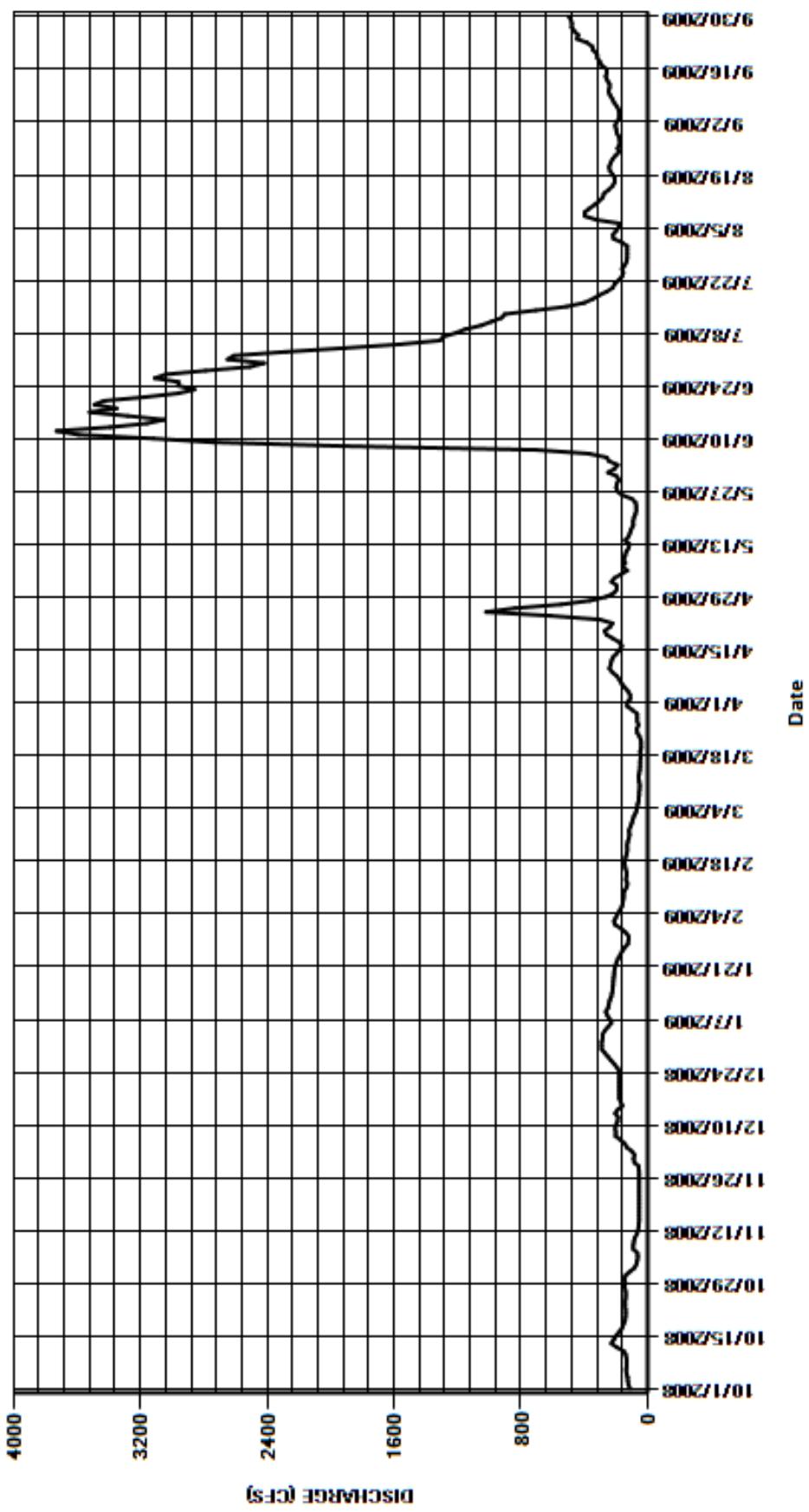
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	114	89	290	205	94	129	195	250	2650	163	205
2	122	85	83	284	213	86	110	195	209	2610	216	197
3	125	72	101	285	201	73	111	228	189	2280	220	180
4	127	66	132	270	189	69	125	211	244	1910	201	180
5	134	63	144	250	175	63	145	168	260	1560	184	183
6	136	65	172	229	162	58	165	129	373	1310	172	193
7	134	91	203	240	157	56	177	160	706	1290	322	211
8	134	91	201	255	153	54	195	142	1920	1210	398	223
9	134	88	205	265	153	52	224	152	2740	1150	398	237
10	139	82	200	250	148	50	242	142	3120	1050	368	248
11	152	68	190	245	133	54	234	136	3590	985	335	241
12	196	61	187	240	128	58	229	120	3730	922	307	241
13	230	58	205	230	138	55	219	116	3390	902	283	255
14	215	56	190	225	134	50	196	143	3160	706	276	265
15	201	54	160	221	133	49	178	121	3050	511	246	259
16	181	55	170	219	141	48	163	112	3280	400	222	260
17	163	55	180	217	145	46	180	104	3520	347	208	293
18	154	54	180	216	145	45	220	91	3350	307	208	303
19	144	54	180	212	139	48	261	92	3490	257	221	319
20	141	54	180	210	132	41	272	88	3430	220	239	320
21	139	54	180	206	128	42	239	77	3170	209	243	344
22	140	55	180	198	130	43	222	72	2960	183	235	351
23	143	55	180	188	127	52	304	73	2860	162	224	383
24	144	55	180	174	119	67	614	76	2960	155	204	447
25	140	55	190	162	115	69	1020	99	2960	163	182	438
26	138	55	210	145	119	58	838	161	3110	144	190	462
27	141	55	230	125	110	66	546	191	3040	133	177	480
28	146	56	250	122	101	66	365	199	2790	130	176	478
29	142	57	270	121	---	67	264	195	2510	129	182	484
30	146	85	290	140	---	97	214	183	2420	129	195	499
31	141	---	290	167	---	129	---	194	---	128	199	---
TOTAL	4632	1968	5802	6601	4073	1905	8401	4365	72781	24242	7394	9179
MEAN	149	65.6	187	213	145	61.5	280	141	2426	782	239	306
AC-FT	9190	3900	11510	13090	8080	3780	16660	8660	144400	48080	14670	18210
MAX	230	114	290	290	213	129	1020	228	3730	2650	398	499
MIN	110	54	83	121	101	41	110	72	189	128	163	180
CAL YR	2008	TOTAL	50087	MEAN	137	MAX	470	MIN	21	AC-FT	99350	
WTR YR	2009	TOTAL	151343	MEAN	415	MAX	3730	MIN	41	AC-FT	300200	

MAX DISCH: 3860 CFS AT 09:15 ON Jun. 12,2009 GH 8.25 FT. (SHIFT N/A)

MAX GH: 8.25 FT. AT 09:15 ON Jun. 12,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
STATELINE DITCH AUG. RETURN TO SOUTH PLATTE
Water Year 2009

Location.--	Lat 40°59'58", long 102°14'55", in NW1/4 NW1/4 of sec 27, T. 12N, R. 44W, Yuma County, East of Julesburg, Co. Gage is about 700 ft. north of US Highway 138 on Yuma County Road 43 near the Colorado-Nebraska Stateline.
Drainage and Period of Record.--	Not determined; Data from 2001 in DWR diversion records, published by Hydrographic Branch since 2007.
Equipment.--	Sutron SDR shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) in metal box enclosure and well section at a 4-foot Parshall flume. The flume is installed in a concrete canal section and is referenced with an outside staff. The high data rate DCP is mounted on poles next to the recorder enclosure.
Hydrographic Conditions.--	Controlled diversion from Julesburg Irrigation District Flow is derived from wells that pump directly into the ditch for delivery to the river as augmentation credit.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data. The record is complete and reliable, except for hours when the float was 'beached' on mud in the well. While flows may have been present below the level where the float was beached, these periods are considered zero for water rights administration purposes. (Credit is not given when record is not maintained.) These periods of zero flow were determined by observation and by inspection of the GH graphs. The ditch turned off frequently, and many bad corrections were made to set the SDR to zero when the float was actually on mud. To fully comply with record procedures, each of these adjustments was dealt with using a datum correction. This meant fifty (50) datum corrections were applied, using water commissioner visits and the SDR event log to guide the proration. The SDR event log was required for this since the Julesburg Irrigation District ditch rider did not record visit information when he set the recorder down to zero when the float was beached, and then corrected it back up when flow started. Corrections this year generally only applied to live flow for a few hours at each start-up time and did not adversely affect the record quality. In 2010, datum corrections will only be used during periods of live flow at this gage.
Datum Corrections.--	Levels have not been run at this gage.
Rating.--	Control is a 4-foot steel Parshall Flume in earth channel. A standard 4- foot Parshall Flume rating, STD04FTPF, was used this year. It is defined from 1.26 cfs (GH = 0.20 ft.) to 67.9 cfs (GH = 2.50 ft). (USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44). Anything above or below this range is outside the +/- 5% accuracy, unless defined by measurements. Days with many hourly flows below 1.26 cfs were November 25, 26, 2008 , March 17, 2009 . Two measurements were made during the year (Nos. 2-3). The peak gage height of 1.64 ft occurred at 0030 on July 13, 2009. This was within the range of the flume. The peak flow of 32.6 cfs occurred at 0030 on July 13, 2009 at a gage height of 1.64 ft with a shift of -0.07 ft.
Discharge.--	Shifting control method was used with shifts distributed by time. Shifts are caused by flume geometry and approach conditions. Both WY Msmts showed shifts of -0.07 ft. Both measurements were given full weight and a -0.07 ft was applied for the entire year.
Special Computations.--	Many periods of zero flow were computed as zero using the rating, bad (mud) GH's, and datum corrections derived from the SDR log. In the future these periods will be manually entered as zero.
Remarks.--	The record is considered good except for the following days which are fair since they are below the defined range for a 4-foot Parshall Flume: November 25, 26, 2008, March 17, 2009. Many hours of record were considered zero for purposes of water rights administration because mud in the stilling well prevented readings. Station maintained and record developed by Devin Ridnour.
Recommendations.--	This station has been operated as summer gage for well augmentation since 2002. A number of things need to be done to bring this record up to publication standards: The well needs to be inspected every so often to verify floats are not beaching at gage heights greater than zero. The ditch-rider needs a paper visit sheet to be kept at the gage to record visits when adjustments were made. If indeed a measurement was made by Nebraska, we should obtain a copy and record it in HMS. Colorado hydrographers need to measure the flume more. Levels should be run on the crest of the flume and the staff.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

STATELINE DITCH AUG. RETURN TO SOUTH PLATTE

RATING TABLE--

STD04FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	12	0	0	0	0	3.9	11	8.8	14	11	5.6
2	11	11	0	0	0	0	9.9	5.5	12	16	11	6.5
3	8.3	6.4	0	0	0	0	16	0.82	14	13	5.6	6.8
4	8.4	3	0	0	0	0	8.8	14	16	9.3	5.8	7.6
5	8.4	1.6	0	0	0	1.8	0	7.5	13	1.6	5	11
6	5.8	1.2	0	0	0	3.1	0	6.2	0.83	6.1	3.8	10
7	5.5	0	0	0	0	0	0	2.7	1.1	11	1.3	9.3
8	7.6	0	0	0	0	0	0	17	9.7	10	0	7.6
9	6.2	0	0	0	0	0	0	7.9	9.5	7.8	0	11
10	6	0	0	0	0	1.2	0	16	6.4	9.6	6.8	10
11	4.6	0	0	0	0	0	0	16	2.5	11	3.9	9.8
12	6.4	0	0	0	0	0	0	16	0.11	18	2.4	9
13	8.7	3	0	0	0	0.46	0	18	0	6.2	5.6	8.5
14	11	1.3	0	0	0	0	0	6.4	0	2.8	7.5	9.9
15	9.4	4.2	0	0	0	1.8	0	20	0	11	8.3	12
16	4.4	5.7	0	0	0	1.5	0	16	1	11	6.1	12
17	4.2	1.7	0	0	0	0	0	15	7.3	8.6	6.8	12
18	5	3.9	0	0	0	0	0	16	3	9.4	3.9	11
19	7	2.3	0	0	0	0	0	13	5.1	8.6	9	10
20	8.4	1.9	0	0	0	0	6.5	13	6.2	9.2	11	12
21	12	4.6	0	0	0	0	9.6	14	6.1	6.2	9	13
22	15	5.2	0	0	0	0	3	14	5	5.9	7	12
23	15	1.6	0	0	0	0	0	14	4.8	9.8	8.5	11
24	14	2	0	0	0	0	0	15	1.5	11	8.8	0.14
25	13	1.3	0	0	0	0	0.46	17	2.1	9.6	6.7	0
26	14	3.3	0	0	0	0	5.5	9.5	1.4	8.6	10	0
27	17	3	0	0	0	0	0	7.4	1.5	8.9	9.9	0
28	15	3.7	0	0	0	0	0	13	0	8.5	9.7	0
29	14	6.6	0	0	---	0	3.9	11	4.3	6.8	9.5	0
30	14	0.3	0	0	---	0	7.9	10	14	6.7	9.7	3.8
31	14	---	0	0	---	0	---	9.4	---	7.3	6.6	---
TOTAL	308.3	90.80	0.00	0.00	0.00	9.86	75.46	372.32	157.24	283.5	210.20	231.54
MEAN	9.95	3.03	0	0	0	0.32	2.52	12	5.24	9.15	6.78	7.72
AC-FT	612	180	0	0	0	20	150	738	312	562	417	459
MAX	17	12	0	0	0	3.1	16	20	16	18	11	13
MIN	4.2	0	0	0	0	0	0	0.82	0	1.6	0	0

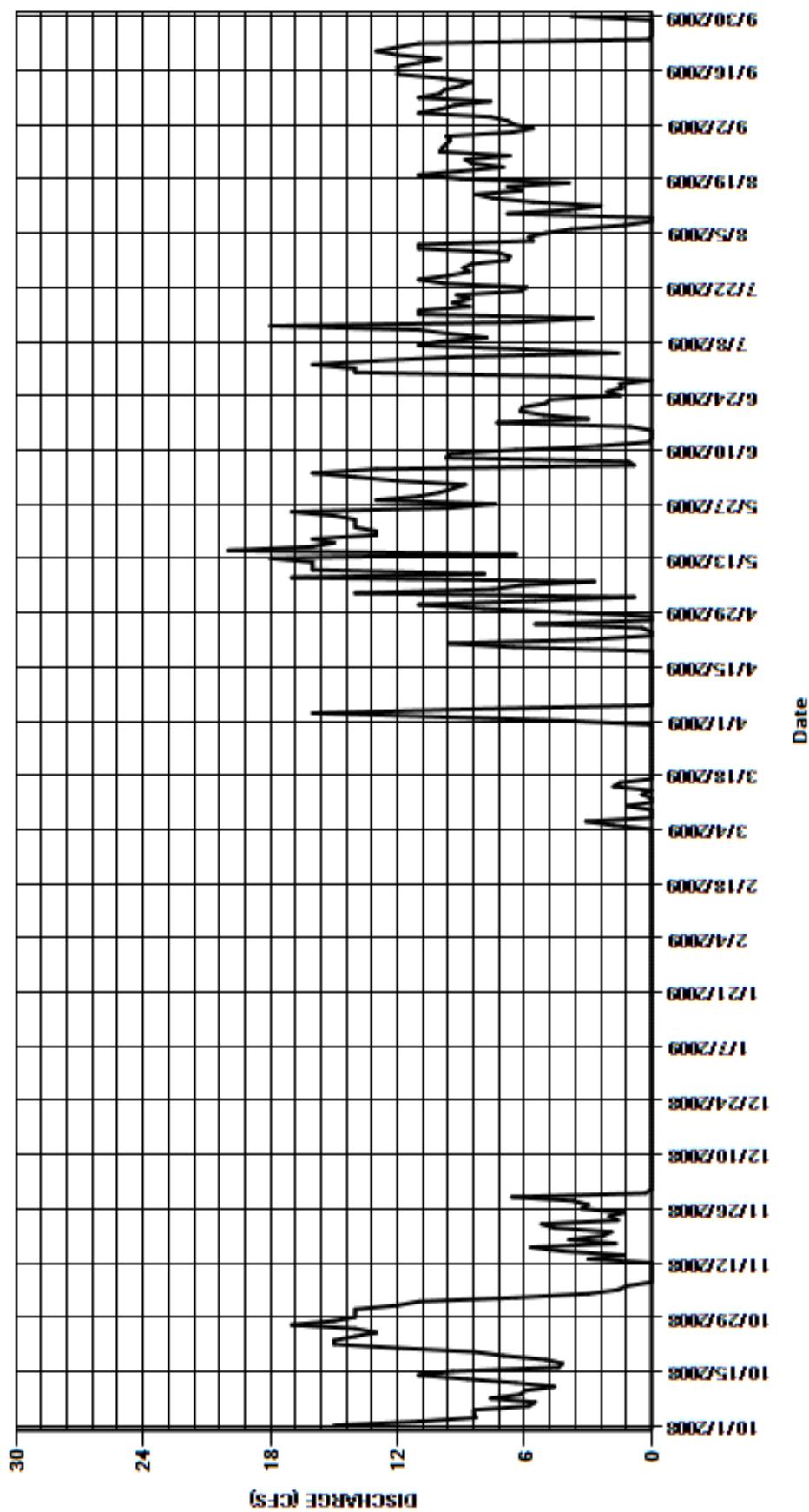
CAL YR	2008	TOTAL	2463.83	MEAN	6.73	MAX	24	MIN	0	AC-FT	4890
WTR YR	2009	TOTAL	1739.22	MEAN	4.76	MAX	20	MIN	0	AC-FT	3450

MAX DISCH: 33 CFS AT 00:30 ON Jul. 13,2009 GH 1.64 FT. SHIFT -0.07 FT.

MAX GH: 1.64 FT. AT 00:30 ON Jul. 13,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

STATELINE DITCH AUG. RETURN TO SOUTH PLATTE
WY2009 HYDROGRAPH



TRANSMOUNTAIN DIVERSIONS INTO THE SOUTH PLATTE BASIN IN COLORADO, WY 2009

WATER YEAR 2009 (October 2008 - September 2009)

FROM THE COLORADO RIVER BASIN

NAME	2008			2009									TOTAL
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
Adams Tunnel*	15330	1037	12907	14893	12275	14003	11566	8097	2743	8649	5334	15696	122,530
Berthoud Pass Ditch	0	0	0	0	0	0	0	0	155	166	38.7	7.57	367
Boreas Pass Ditch	0	0	0	0	0	0	0	3.21	59.6	41.9	0.700	0	105
Grand River Ditch	44.2	0	0	0	0	0	0	1482	3949	3716	487	95.2	9,773
A.P. Gumlick Tunnel**	0	0	0	0	0	0	0	0	206	0	0	0	206
Moffat Tunnel	1490	715	435	301	210	240	472	11905	1575	3426	1498	146	22,412
Roberts Tunnel	3729	3236	2254	2157	1920	2140	1033	2204	0.00	1407	4637	4164	28,881
Straight Creek Tunnel	6.31	5.12	4.14	3.43	3.01	2.62	3.23	16.0	44.6	28.2	11.4	6.58	135
Vidler Tunnel	0	0	0	0	0	0	0	77.0	324	225	21.4	0	648
TOTALS FROM THE COLORADO RIVER BASIN (DAY-CFS)													185,057
TOTALS FROM THE COLORADO RIVER BASIN (ACRE-FT)													367,060

*West slope water only

**Direct release to Clear Creek only. All other flow included in Moffat Tunnel

FROM THE LARAMIE RIVER BASIN

NAME	2008			2009									TOTAL
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
Bob Creek Ditch	0	0	0	0	0	0	0	100	50.6	0	0	0	151
Columbine Ditch	0	0	0	0	0	0	0	0	0	0	0	0	0
Deadman Ditch	0	0	0	0	0	0	0.13	256	315	75.4	4.47	0	651
Laramie-Poudre Tunnel	0	0	0	0	0	0	0	1412	208	3736	1211	519	7,085
Skyline Ditch	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS FOR THE LARAMIE RIVER (DAY-CFS)	WY2009												7,887
TOTALS FOR THE LARAMIE RIVER (AF, 19875 AF per CALENDAR Year Allowed Under Laramie River Agreement)	WY2009												15,643
TOTALS FOR THE LARAMIE RIVER (AF, 19875 AF per CALENDAR Year Allowed Under Laramie River Agreement)	CY2009												15,975
Wilson Supply Ditch (Gage) minus Deadman Ditch = SAND CR. DIVERSION***	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
	0	0	0	0	0	0	0	812	565	88.5	5.11	0	1,471
	0	0	0	0	0	0	0.13	256	315	75.4	4	0	651
Wilson Supply Ditch (Gage) minus Deadman Ditch = SAND CR. DIVERSION***	0	0	0	0	0	0	0	556	250	13.09	1	0	820
*** Negative Numbers due to Deadman Ditch Losses													
TOTALS FROM THE LARAMIE RIVER BASIN (DAY-CFS)													8,707
TOTALS FROM THE LARAMIE RIVER BASIN (ACRE-FT)													17,270

FROM THE NORTH PLATTE RIVER BASIN

NAME	2008			2009									TOTAL	
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
Cameron Pass Ditch	0	0	0	0	0	0	0	0	83.1	17.5	0	0	101	
Michigan Ditch	88.2	41.6	20.5	19.7	13.7	13.7	13.9	373	1249	825	215	108	2,981	
TOTALS FROM THE NORTH PLATTE RIVER BASIN (DAY-CFS)														3,082
TOTALS FROM THE NORTH PLATTE RIVER BASIN (ACRE-FT)														6,112

SPECIAL CATEGORIES

NAME	2008			2009									TOTAL
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
Hoosier Pass Tunnel *	899	89.4	0	0	0	0	71.5	1347	931	540	384	0	4,262
Aurora Homestake Pipeline**	2289	2233	2324	2388	2155	2356	2248	1772	0	81.3	1122	0	18,968

* Diverts into Division One, but entire flow is piped to the City of Colorado Springs in Division 2

** Contains a Mixture of Colorado River Water and Water Transferred from the Arkansas River

PLATTE RIVER BASIN
AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR
Water Year 2009

Location.-- Lat. 38°56'53", Long. 105°41'02", in Park County above Spinney Mountain Reservoir.

Drainage and Period of Record.-- 1998 to present.

Equipment.-- Two 36-in venturi meters in a pipeline, equipped with satellite monitoring upstream of two sleeve type (Bailey) control valves with open discharge. The data collection platform (DCP), venturi meters and facilities are owned and maintained by the City of Aurora. There are two meters; one is the main discharge to Spinney Reservoir (discharge #1), and the other discharge valve (discharge #2) functions as a pressure-relief (surge) for the pipeline. Both releases are monitored by the DCP and by the combined Aurora and City of Colorado Springs Supervisory Control and Data Acquisition (SCADA) system.

Hydrographic Conditions.-- Flow is comprised of transmountain water imported from a number of sources in the Colorado River Basin, Colorado River water stored on the Eastern slope from previous years, and native Arkansas River water transferred from points downstream. All flow is diverted to Twin Lakes Reservoir and transported in the Homestake pipeline to the Otero Pump Station. The pipeline delivers water to Aurora at Spinney Mountain Reservoir and continues to the City of Colorado Spring's Rampart Reservoir. Colorado River water is included in deliveries of Homestake Tunnel, Busk-Ivanhoe Tunnel and Twin-Lakes Tunnel. In general the total flow at this gage represents approximately 45% Colorado River Water, and 55% Arkansas basin water. Water deliveries are ordered to Spinney Reservoir through the main discharge (Discharge #1). Spikes of water from the pressure relief valve (Discharge #2) are usually small and infrequent. This water drains into Spinney and its accrual is accidental and can occur when water is not delivered through the main discharge.

Gage-Height Record.-- The primary record is two sets of hourly averages of 15 minute satellite data with SCADA system data used as back up. When DCP data was not available or reliable, values from the combined Aurora and City of SCADA system accounting was used. The SCADA system prints the daily report at 12:01 for the previous day. The SCADA system reports discharge 1 as "Aurora Flow" and discharge 2 as "Relief Flow". Missing data due to power interruptions or transmission errors was replaced by SCADA system data on the following days: October 5, 6, 2008 – 14 hours; November 11, 2008 – 6 hours; November 23, 2008 – 1 hour; June 2, 2009 – 7 hours; June 21, 2009 – 3 hours; July 16 – 22, 2009 – 1 to 4 hours; September 29, 2009 – 0.5 hours. For the period on June 2, 2009 from 02:00 to 08:45 for Discharge 1, the missing values were edited as zero as there were no releases from the pipeline from May 27 to August 11, 2009. The record is complete and reliable.

Datum Corrections.-- Not applicable.

Rating.-- The only way to rate the meters would be by direct measurements, and this has not been done since sometime in the 80's. A mass balance spreadsheet is routinely used by Otero Pump Station personal to check discharge at the Spinney Tap. The transmitter on the Discharge # 1 venturi meter was calibrated by the City of Aurora Instrumentation division on January 8, 2009. The transmitter was found to be in tolerances and no adjustments were made.

Discharge.-- No measurements were made this year. Peak flow of 82.6 cfs was recorded on Discharge 1 at 19:15, October 1, 2008. This was the total peak flow for the water year. Peak flow of 55.0 cfs was recorded on Discharge 2 11:15, May 26, 2009.

Special Computations.-- The DCP reports data directly in discharge (CFS). Two spreadsheets are required, one for each venturi meter. Two record spreadsheet are checked, one for Discharge # 1 and one for Discharge # 2. The total flows were entered manually into a third record spreadsheet and a YRS file generated. Peak discharge usually corresponds to the peak from the main discharge. For periods when the pressure relief valve operates, however, combined discharges must be examined. It is possible that a combined flow peak might be higher than the main discharge.

Remarks.-- The record must be regarded as fair until the meter is calibrated with discharge measurements. Record developed by Mike Wild.

Recommendations.-- Add data logger to ensure more reliable data collection. Use Sutron Xlite data logger model number 9210-SL2-ENC-B (includes SatLink2) or Sutron Monitor – 1 Data logger.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR

RATING TABLE--

STCONVERT USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

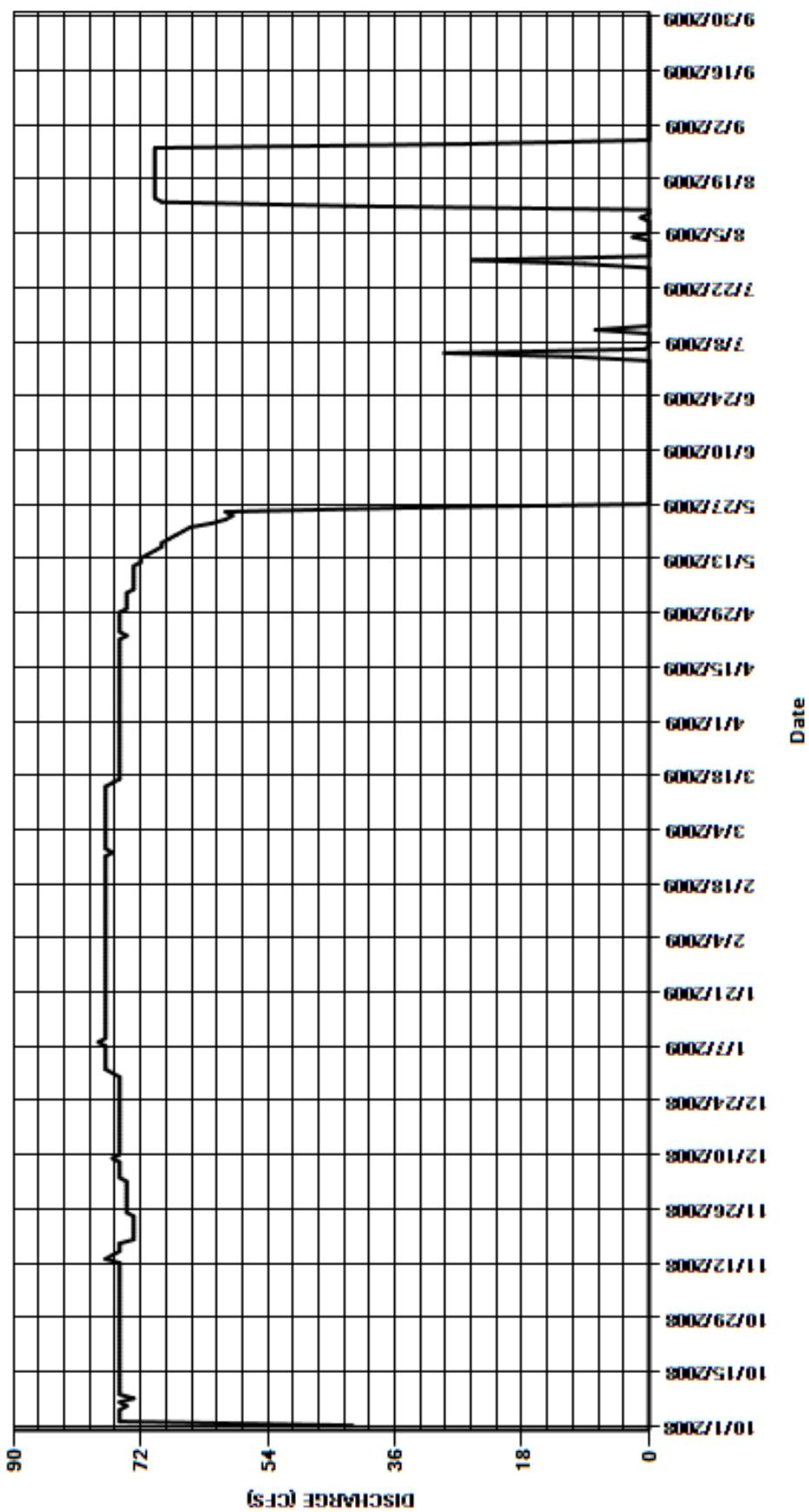
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	75	74	77	77	77	75	74	0	0	0	0
2	75	75	74	77	77	77	75	74	0	0	0	0
3	75	75	74	77	77	77	75	74	0	0	0	0
4	75	75	75	77	77	77	75	74	0	10	2.3	0
5	75	75	75	77	77	77	75	73	0	29	0	0
6	74	75	75	77	77	77	75	73	0	0.57	0	0
7	75	75	75	77	77	77	75	73	0	0	0	0
8	73	75	75	78	77	77	75	73	0	0	0	0
9	75	75	76	77	77	77	75	73	0	0	1.2	0
10	75	75	75	77	77	77	75	73	0	0	0	0
11	75	75	75	77	77	77	75	73	0	7.6	0	0
12	75	75	75	77	77	77	75	72	0	0	43	0
13	75	77	75	77	77	77	75	72	0	0	69	0
14	75	76	75	77	77	77	75	71	0	0	70	0
15	75	75	75	77	77	77	75	70	0	0	70	0
16	75	75	75	77	77	76	75	69	0	0	70	0
17	75	75	75	77	77	75	75	69	0	0	70	0
18	75	73	75	77	77	75	75	68	0	0	70	0
19	75	73	75	77	77	75	75	67	0	0	70	0
20	75	73	75	77	77	75	75	66	0	0	70	0
21	75	73	75	77	77	75	75	65	0	0	70	0
22	75	73	75	77	77	75	75	62	0	0	70	0
23	75	73	75	77	77	75	74	60	0	0	70	0
24	75	73	75	77	77	75	75	59	0	0	70	0
25	75	74	75	77	77	75	75	60	0	0	70	0
26	75	74	75	77	76	75	75	35	0	0	70	0
27	75	74	75	77	77	75	75	0	0	0	70	0
28	75	74	75	77	77	75	75	0	0	9.1	26	0
29	75	74	75	77	---	75	75	0	0	25	0	0
30	75	74	75	77	---	75	74	0	0	0	0	0
31	75	---	76	77	---	75	---	0	---	0	0	---
TOTAL	2289	2233	2324	2388	2155	2356	2248	1772.00	0.00	81.27	1121.50	0.00
MEAN	73.8	74.4	75	77	77	76	74.9	57.2	0	2.62	36.2	0
AC-FT	4540	4430	4610	4740	4270	4670	4460	3510	0	161	2220	0
MAX	75	77	76	78	77	77	75	74	0	29	70	0
MIN	42	73	74	77	76	75	74	0	0	0	0	0
CAL YR	2008	TOTAL	13593.53	MEAN	37.1	MAX	77	MIN	0	AC-FT	26960	
WTR YR	2009	TOTAL	18967.77	MEAN	52	MAX	78	MIN	0	AC-FT	37620	

MAX DISCH: 82.6 CFS AT 19:15 ON Oct. 01,2008

MAX GH: FT. (N/A)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA
Water Year 2009

Location.--	Lat. 39°21'33", Long. 106°04'37"; Park County, tunnel diverts water from tributaries of Blue River in Colorado River basin to Montgomery Res. (Middle Fork South Platte River) in sec. 14, T. 8 S., R. 78 W., in Platte River basin.
Drainage and Period of Record.--	1952 to present.
Equipment.--	Stage-discharge recorder (Sutron SDR) and satellite monitoring DCP (HDR Sutron Satlink 2) at an 8-foot Parshall flume with a metal stilling well. Flume and equipment are housed inside the tunnel entrance. Facilities are owned and maintained by the City of Colorado Springs. Satellite equipment is owned and maintained by DWR.
Hydrographic Conditions.--	Transmountain diversion, operates seasonally. Flows are intercepted from Blue River Headwaters and will follow a diurnal pattern as snowpack melts. Diversion can be called out (shut off) by senior water rights on the Blue River and further downstream. The flow is controlled by numerous diversions into the tunnel inlet from the Blue River drainage.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data. A Stevens F Type chart recorder was used as backup until being replaced by a Sutron SDR stage-discharge recorder. The replacement was completed in April of 2009 and corresponds with the beginning of seasonal operations. Gage heights (GH) less than 0.09 ft were considered as non-operational flow. The following periods with GH less than 0.09 ft were adjusted to zero for the record: November 10, 1300 to November 11, 0800; April 3, 1400 to April 5, 1400; August 18, 1800 to September 30, 2300. Gage Height calibration was good. Sixteen visits were made to the gage and no adjustments were needed during periods of operational flow. The chart agreed with the DCP record to within 0.02 ft and the SDR data agreed with the DCP data to within 0.01 ft.
Datum Corrections.--	Levels were run on 9/28/2009. The RP was found to be 0.005 ft low (so the gage was found to read 0.005 high) which is within the allowable limits of 0.02 ft. so no correction to the RP was necessary. However, the drop tape weight was deformed. This caused the tape to be 0.005 too long and for the GH to read an additional 0.005 ft high. When the tape and weight were replaced, the tape length was set to the found elevation (4.045 ft instead of the established 4.05 ft.). This caused a total change in GH reading of 0.01 ft. This tape correction was made during a period of zero flow at the end of the water year. It was not applied to the record or measurements. The 8-foot Parshall flume was found to be 0.02 ft. higher on the LEW side than on the REW side. This is consistent with past results.
Rating.--	Control is a standard 8 foot Parshall Flume and a standard rating is used. Five measurements were made during the 2009 water year (Nos. 130 to 134) ranging in discharge from 9.68 to 67.5 cfs. Flows above and below the measured range are not listed as the rating is presumed to be valid over its entire range. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of flows accurately measured by an 8 ft Parshall Flume is from 3.5 to 139.5 cfs. Anything above or below this range is outside the +/- 5% accuracy. The following days had average flows below the range of accuracy and were considered poor record: Nov. 10, April 5-22, and June 27-July 10. The peak flow of 114 cfs occurred at 1945 on May 31, 2009 at a gage height of 2.21 ft. with a shift of 0.00 ft. It exceeded measurement number 132, made May 19, 2009, by 0.62 ft. in stage.
Discharge.--	Shifting Control method was used all season. Get-away conditions are good; submergence of the control is not a problem. Moss and algae are not a factor, since the flume is in the tunnel. Rust in the flume appears to be increasing, and may be affecting the shifts. Shifts may also be affected by deformities in the vertical walls of the flume, which can be observed especially in the area of the staff gage. The shift of 0.00 ft was used throughout the 2009 water year. Measurements within 5 % of the rating are adjusted to zero by agreement with Colorado Springs Utilities. Measurement numbers 130, 133, and 134 were adjusted by -5.1%, -1.8%, and -1.1% respectively from a shift of -0.01 ft. to a shift of 0.00 ft. The non-zero range of daily discharge was 0.79 to 114 cfs.
Special Computations.--	Operationally, gage heights less than 0.09 ft represent zero flow, since they are either a true zero flow or water in the flume when the tunnel is not being operated.
Remarks.--	The record is considered good due to the increased definition by measurements, except for the low flows on Nov. 10, April 5-22, and June 27-July 10, which are below the accuracy range for an 8- foot Parshall flume, and are rated fair. Record developed by Garver Brown.
Recommendations.--	Continuing efforts should be made to maintain and develop good satellite record in 2010. These efforts should include: A station visit sheet should continue being kept to record encoder calibration. The Colorado Springs operator should continue to reset the encoder (when needed) on his weekly visits or to record the SE read if it is off and notify the water commissioner. Attempts should continue to be made to measure at least monthly. Levels should be run in 2010.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA

RATING TABLE--

STD08FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

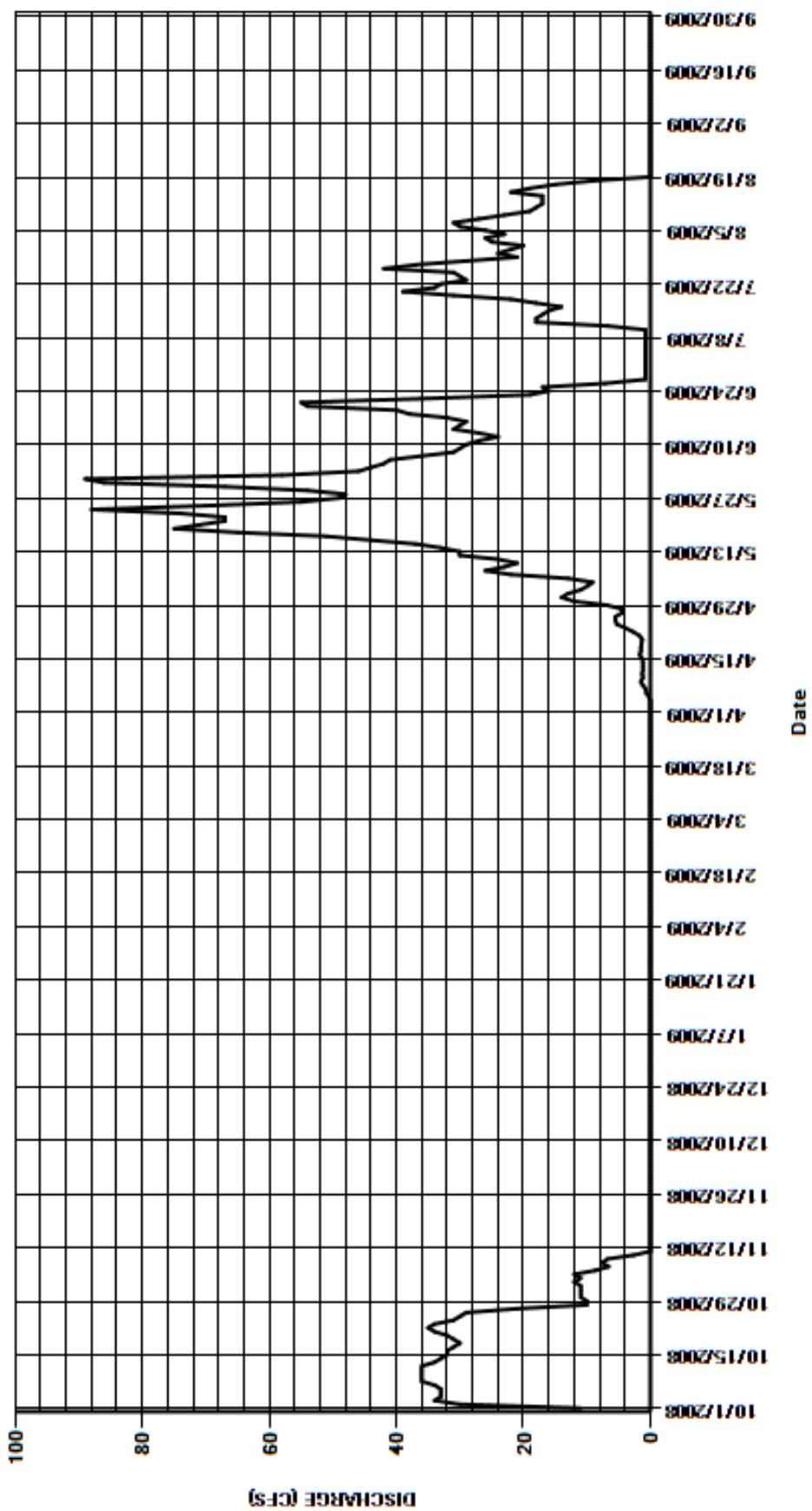
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	11	0	0	0	0	0	14	89	0.79	20	0
2	30	11	0	0	0	0	0	13	58	0.79	25	0
3	34	12	0	0	0	0	0	11	46	0.79	26	0
4	33	11	0	0	0	0	0	9.9	44	0.79	23	0
5	33	12	0	0	0	0	0.25	9.1	42	0.79	26	0
6	33	8.7	0	0	0	0	0.66	13	41	0.79	30	0
7	34	6.6	0	0	0	0	0.7	22	36	0.79	31	0
8	36	7.6	0	0	0	0	1.2	26	31	0.79	27	0
9	36	6.8	0	0	0	0	1.5	23	30	0.79	23	0
10	36	2.7	0	0	0	0	1.2	21	29	0.79	19	0
11	36	0	0	0	0	0	1.3	24	27	6.7	18	0
12	36	0	0	0	0	0	1.2	30	24	18	17	0
13	34	0	0	0	0	0	1.2	30	27	18	17	0
14	33	0	0	0	0	0	1.2	33	31	17	17	0
15	32	0	0	0	0	0	1.3	37	30	16	22	0
16	32	0	0	0	0	0	1.7	44	29	14	19	0
17	31	0	0	0	0	0	1.5	51	32	18	15	0
18	30	0	0	0	0	0	1.5	65	38	22	8.9	0
19	31	0	0	0	0	0	1.4	75	40	31	0	0
20	32	0	0	0	0	0	1.3	71	54	39	0	0
21	34	0	0	0	0	0	1.7	67	55	34	0	0
22	35	0	0	0	0	0	2.7	67	36	33	0	0
23	34	0	0	0	0	0	3.9	74	19	29	0	0
24	31	0	0	0	0	0	5.3	88	16	30	0	0
25	30	0	0	0	0	0	5.5	70	17	31	0	0
26	29	0	0	0	0	0	5.5	55	7.1	42	0	0
27	21	0	0	0	0	0	4.4	49	0.83	37	0	0
28	10	0	0	0	0	0	4.5	48	0.79	29	0	0
29	10	0	0	0	---	0	6.9	54	0.79	21	0	0
30	11	0	0	0	---	0	12	67	0.79	24	0	0
31	11	---	0	0	---	0	---	86	---	22	0	---
TOTAL	899	89.40	0.00	0.00	0.00	0.00	71.51	1347.0	931.30	539.60	383.90	0.00
MEAN	29	2.98	0	0	0	0	2.38	43.5	31	17.4	12.4	0
AC-FT	1780	177	0	0	0	0	142	2670	1850	1070	761	0
MAX	36	12	0	0	0	0	12	88	89	42	31	0
MIN	10	0	0	0	0	0	0	9.1	0.79	0.79	0	0
CAL YR	2008	TOTAL	6515.30	MEAN	17.8	MAX	119	MIN	0	AC-FT	12920	
WTR YR	2009	TOTAL	4261.71	MEAN	11.7	MAX	89	MIN	0	AC-FT	8450	

MAX DISCH: 114 CFS AT 19:45 ON May. 31,2009 GH 2.21 FT. SHIFT 0 FT.

MAX GH: 2.21 FT. AT 19:45 ON May. 31,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
09046000 BOREAS PASS DITCH AT BOREAS PASS
Water Year 2009

Location.-- Lat 39°24'37", long 105°58'05". Diverts water from tributaries of Blue River in Colorado River basin to Tarryall Creek in sec. 26, T.7 S., R.77 W., in Platte River basin.

Drainage and Period of Record.-- Gage established in 1932, with continuous record from 1950 to present, and for some years prior to 1950.

Equipment.-- Sutron SatLink 2 Data Collection Platform (DCP), Sutron Stage Discharge Recorder (SDR), and a photovoltaic battery charging system at an 1.5 foot Parshall flume with a metal stilling well. The ditch goes underground after collection, and the flume and equipment are housed inside a manhole. The flume is set into the concrete pipeline, approximately 14 ft. underground. A staff gage in the flume is used as the primary reference gage. The gage and equipment are owned by the City of Englewood. The DCP and ditch gates are operated by an independent contractor under a special contract arrangement with Englewood.

Hydrographic Conditions.-- Alpine tundra, willows and talus slopes above timberline.

Gage-Height Record.-- The primary record is hourly averages of 15 minute data satellite data. A Sutron SDR is utilized for data back up. The gage was operated and satellite data were collected from May 29 15:00 hours to August 2, 2009 10:00 hours. The gage was visited 6 times during the 2009 water year. The record is complete and reliable. The data for days with partial data on start up and shut down of satellite equipment (5/29 and 8/2, 2009) were hand entered into the record. Gage heights less than 0.09 ft (PZF) were adjusted to zero from May 24 13:00 hours to May 29 14:00 hours when the DCP was recording but no diversion was made.

Datum Corrections.-- No levels have been run and no datum corrections were used for the record. The flume was installed in 1992, and appears to be level perpendicular with stream flow, with all measurements this year showing consistent depths at all verticals. However a hand level shows a slight increase in elevation from upstream towards the downstream.

Rating.-- The control is a 1.5 foot Parshall flume, with a standard rating, STD01HFTP. Two measurements were made this year (Nos. 27-28), ranging in discharge from 1.89 to 2.00 cfs. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate discharge measurement for a 1.5 ft Parshall Flume is 0.15 to 24.6 cfs. Anything above or below this range is outside the +/- 5% accuracy range. All flows during the 2009 water year were within this range during the operational period of the gage. Peak flow of 2.95 cfs occurred at 1130 on June 26, 2009 at a gage height of 0.67 ft with a shift of -0.04 ft. It exceeded measurement No. 28 made July 7, 2009 by 0.14 ft. in stage.

Discharge.-- The shifting control method was used all year. Shifts were applied as defined by measurements. Negative shifts are most likely caused by flume tilt or by approach velocities, but not by moss.

Special Computations.-- None.

Remarks.-- The record is good. The gage is seasonal and runs typically from May/June to August. The permanent nature of the flume installation suggests that some permanent level of shift is built into the flume. Point of zero flow has been observed at a gage height of 0.09 ft. This indicates the height of the intake above the flume floor which traps water in the stilling well. Record developed by Mike Wild.

Recommendations.-- Flume condition should be checked for corrosion and possible remediation.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09046000 BOREAS PASS DITCH AT BOREAS PASS

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	1.5	2.4	0.48	0
2	0	0	0	0	0	0	0	0	1.6	2.4	0.22	0
3	0	0	0	0	0	0	0	0	1.7	2.3	0	0
4	0	0	0	0	0	0	0	0	1.8	2.2	0	0
5	0	0	0	0	0	0	0	0	1.8	2.2	0	0
6	0	0	0	0	0	0	0	0	1.9	2.1	0	0
7	0	0	0	0	0	0	0	0	2	2	0	0
8	0	0	0	0	0	0	0	0	2	1.9	0	0
9	0	0	0	0	0	0	0	0	1.9	1.8	0	0
10	0	0	0	0	0	0	0	0	1.8	1.7	0	0
11	0	0	0	0	0	0	0	0	1.7	1.7	0	0
12	0	0	0	0	0	0	0	0	1.6	1.6	0	0
13	0	0	0	0	0	0	0	0	1.5	1.5	0	0
14	0	0	0	0	0	0	0	0	1.5	1.4	0	0
15	0	0	0	0	0	0	0	0	1.5	1.4	0	0
16	0	0	0	0	0	0	0	0	1.5	1.3	0	0
17	0	0	0	0	0	0	0	0	1.6	1.2	0	0
18	0	0	0	0	0	0	0	0	1.7	1.1	0	0
19	0	0	0	0	0	0	0	0	1.8	1.1	0	0
20	0	0	0	0	0	0	0	0	2	0.99	0	0
21	0	0	0	0	0	0	0	0	2.1	0.92	0	0
22	0	0	0	0	0	0	0	0	2.3	0.85	0	0
23	0	0	0	0	0	0	0	0	2.4	0.79	0	0
24	0	0	0	0	0	0	0	0	2.5	0.74	0	0
25	0	0	0	0	0	0	0	0	2.6	0.7	0	0
26	0	0	0	0	0	0	0	0	2.7	0.69	0	0
27	0	0	0	0	0	0	0	0	2.7	0.62	0	0
28	0	0	0	0	0	0	0	0	2.7	0.58	0	0
29	0	0	0	0	---	0	0	0.51	2.7	0.56	0	0
30	0	0	0	0	---	0	0	1.3	2.5	0.61	0	0
31	0	---	0	0	---	0	---	1.4	---	0.52	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.21	59.6	41.87	0.70	0.00
MEAN	0	0	0	0	0	0	0	0.1	1.99	1.35	0.023	0
AC-FT	0	0	0	0	0	0	0	6.4	118	83	1.4	0
MAX	0	0	0	0	0	0	0	1.4	2.7	2.4	0.48	0
MIN	0	0	0	0	0	0	0	0	1.5	0.52	0	0

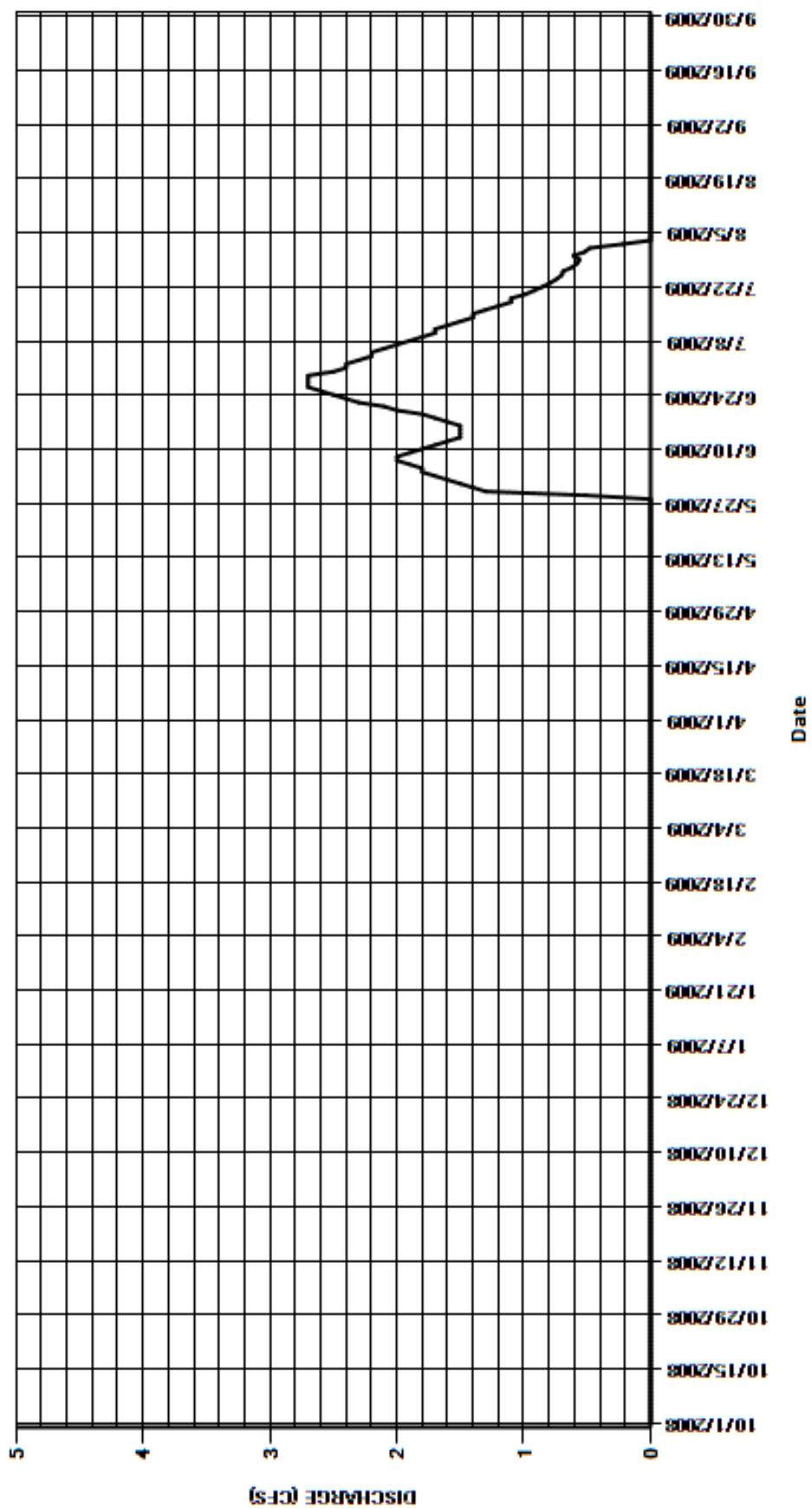
CAL YR	2008	TOTAL	85.65	MEAN	0.23	MAX	2.5	MIN	0	AC-FT	170	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	105.38	MEAN	0.29	MAX	2.7	MIN	0	AC-FT	209	(PARTIAL YEAR RECORD)

MAX DISCH: 3 CFS AT 11:30 ON Jun. 26,2009 GH 0.67 FT. SHIFT -0.04 FT.

MAX GH: 0.67 FT. AT 11:30 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09046000 BOREAS PASS DITCH AT BOREAS PASS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
Water Year 2009

Location.--	Lat. 39°27'50", Long. 105°41'01"; Harold D. Roberts tunnel diverts water from Dillon Reservoir in Blue River basin, to North Fork South Platte River (tributary to South Platte River) in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, T. 7 S., R. 74 W., in Platte River basin.
Drainage and Period of Record.--	1963 to present.
Equipment.--	A Stevens's 2A-35 graphic stage recorder and Sutron 8210 DCP with digital shaft encoder in a concrete shelter and stilling well connected to a 20 foot Parshall flume. Primary reference is an electric drop tape with the reference mark (R.M.) on the base of the electric tape with a supplemental staff gage. The Sutron 8210 DCP was replaced with a Sutron SatLink 2 DCP on Oct. 3, 2008.
Hydrographic Conditions.--	A transmountain diversion delivering water from Dillon Reservoir on the Western Slope to the South Platte River drainage on the Eastern Slope.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data with chart backup. The record is complete and reliable. The recording equipment functions well and is considered reliable during cold weather due to a heat lamp and electric heater installed within the shelter and well. During zero-flow periods, there can be a residual gage height of about 0.05 ft due to standing water in the well. The inlet is slightly above the floor of the flume. Zero flow is also at times determined operationally. Sometimes periods of hours will occur with GH's from .05 ft to 0.15 ft. that Denver Water Board Department records show as zero. These hours are also zeroed out in the published record. Zero flow was observed on the following days: April 16-May 6, 2009. May 11-19, 2009; May 27-July 17, 2009; July 22-25, 2009 ; July 31-August 3, 2009 .
Datum Corrections.--	Levels were run across the crest of the flume to the R.P. on November 27, 2008. Results were found to be within the +/- 0.02 ft limit.
Rating.--	The control is a standard twenty-foot Parshall flume. The standard rating was continued for this year. Ten discharge measurements (Nos. 359 - 368) were made this year ranging in discharge from 51 to 318 CFS. STD20FTPF is a standard 20-foot Parshall Flume rating that is defined from 10 to 1000 cfs. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 20 ft Parshall Flume is 10 to 1000 cfs. Anything above or below this range is outside the +/- 5% accuracy range unless defined by measurements. Flows above or below the defined or measured range did not occur in 2009. The peak flow of 350 cfs occurred at 1345 on May 22, 2009 at a gage height of 2.56 ft. with a shift of 0.03 ft. It exceeded measurement No. 366, made July 20, 2009 by 0.16 ft. in stage.
Discharge.--	Shifts are caused by approach velocities and by moss. In a clean flume, positive shifts are seen above about 50 cfs due to approach conditions (flow angles away from the inlets). Also in a clean flume, negative shifts are seen when the rating equation is extended below the 10 cfs limit. When moss is allowed to build up, the shift becomes less positive or more negative. Water is usually brought through the tunnel in constant runs for power generation, and turned off periodically for maintenance to the power generation facilities. The trend is for moss-related shifting to build up during the constant runs. When the flow is shut off, the moss dies and a more positive shift is seen at restart. Shifting is normally accomplished by using time shifting during periods when moss is building and stage variations do not require the use of stage shifts. In 2009, the flume was kept clean all year, however there was not much variation in shifts or stage throughout the year. The shifts have been prorated by time through the entire water year. Of the ten measurements made this year, all were given full weight, except Msmt Nos. 359, 363, and 367, which were adjusted from 1% to 3% to better fit the distribution. An important consideration in shift distribution is the relationship of computed discharges to the flows computed at the North Fork of the South Platte at Grant, ½ mile downstream. Flows at Roberts Tunnel should always be less than Grant. Some native inflow below the Roberts inflow should also be seen at Grant, particularly from Geneva Creek and from Kenosha creek. Shift effects of moss are sometimes worked backward to reconcile flows at Roberts and Grant.
Special Computations.--	A spreadsheet of daily discharges for Roberts Tunnel and North Fork South Platte River at Grant is used to insure that the difference between the two gages is reasonable.
Remarks.--	The record is rated as good . Station maintained and record developed by Patrick Tyler.
Recommendations.--	This record should be worked on a monthly basis to insure that any bad balance of flows existing between Roberts Tunnel and the NFSP at Grant gage is addressed promptly. All datum corrections should be applied by manual entry, rather than by time, with consideration to the flows at Grant.

STATE OF COLORADO
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09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

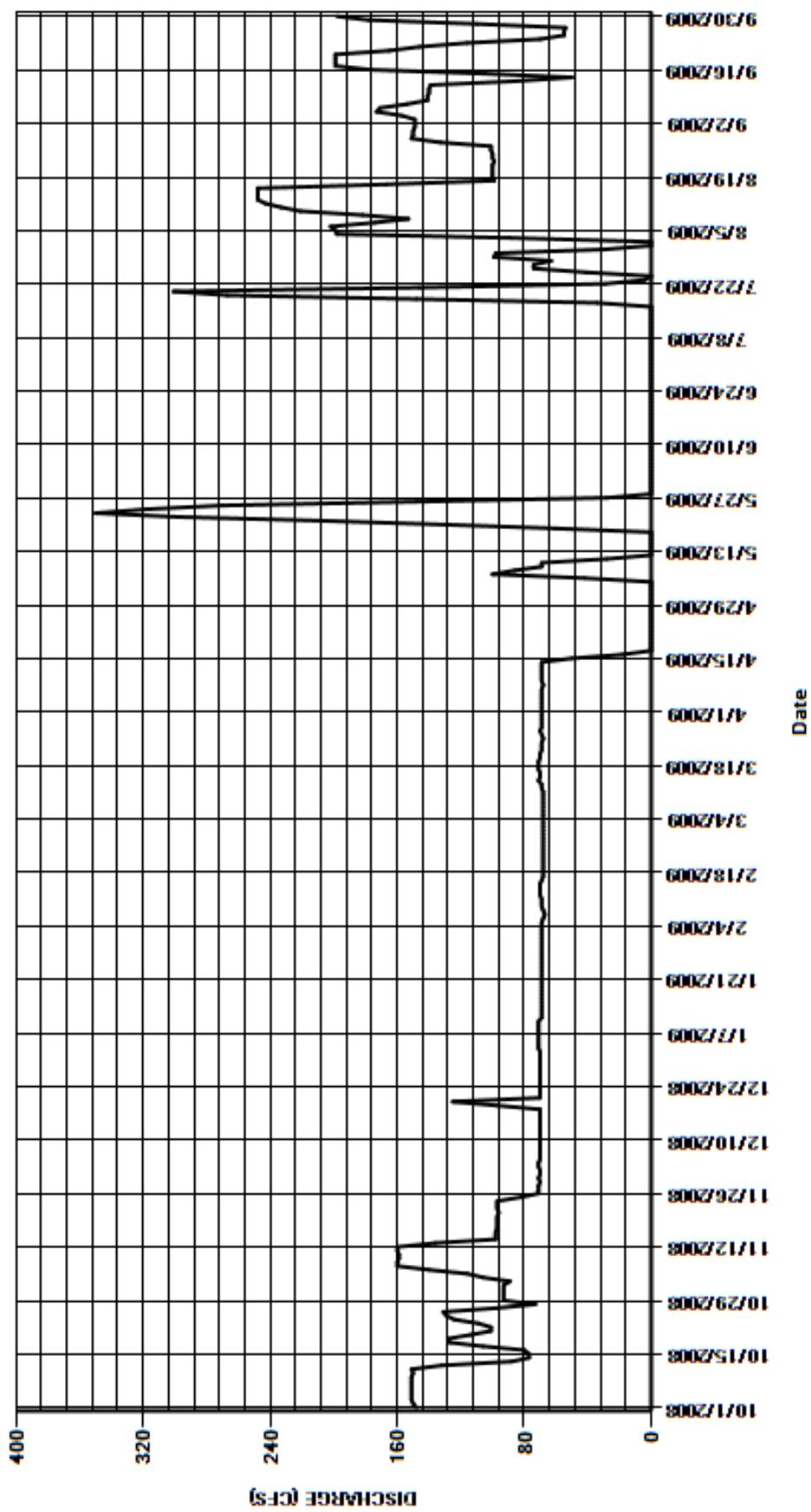
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	148	93	70	70	69	68	69	0	0	0	0	149
2	150	93	70	70	69	68	69	0	0	0	0	149
3	151	89	71	71	69	68	69	0	0	0	89	149
4	151	106	71	71	69	68	69	0	0	0	198	157
5	151	116	70	71	69	68	69	0	0	0	199	173
6	151	140	70	71	68	68	69	42	0	0	202	171
7	151	160	70	71	67	68	69	100	0	0	174	154
8	151	160	70	71	68	68	68	86	0	0	153	141
9	151	159	70	71	69	68	69	69	0	0	182	141
10	150	159	70	71	69	68	69	69	0	0	221	140
11	151	160	70	69	69	68	69	28	0	0	233	140
12	132	160	70	69	70	69	69	0	0	0	243	139
13	88	136	70	69	70	69	69	0	0	0	248	86
14	77	98	70	69	70	71	69	0	0	0	248	50
15	77	98	70	69	70	70	50	0	0	0	248	105
16	80	98	70	69	69	70	18	0	0	0	248	177
17	106	97	70	69	68	71	0	0	0	34	167	199
18	127	97	70	69	68	71	0	0	0	148	99	199
19	128	97	97	69	68	71	0	60	0	267	100	199
20	114	97	125	69	68	70	0	130	0	301	100	199
21	101	96	70	69	68	70	0	208	0	146	100	165
22	101	97	70	69	68	69	0	298	0	29	100	146
23	109	97	70	69	68	69	0	350	0	4.2	99	116
24	124	97	70	69	68	69	0	318	0	0	100	70
25	129	82	70	69	68	68	0	270	0	41	100	55
26	131	71	70	69	68	69	0	148	0	74	101	55
27	97	71	70	69	68	70	0	28	0	74	101	54
28	73	71	70	69	68	69	0	0	0	63	133	110
29	93	70	70	69	---	69	0	0	0	99	151	178
30	93	71	70	69	---	69	0	0	0	98	150	198
31	93	---	70	69	---	69	---	0	---	29	150	---
TOTAL	3729	3236	2254	2157	1920	2140	1033.00	2204.00	0.00	1407.20	4637.00	4164
MEAN	120	108	72.7	69.6	68.6	69	34.4	71.1	0	45.4	150	139
AC-FT	7400	6420	4470	4280	3810	4240	2050	4370	0	2790	9200	8260
MAX	151	160	125	71	70	71	69	350	0	301	248	199
MIN	73	70	70	69	67	68	0	0	0	0	0	50
CAL YR	2008	TOTAL	45484.30	MEAN	124	MAX	525	MIN	0	AC-FT	90220	
WTR YR	2009	TOTAL	28881.20	MEAN	79.1	MAX	350	MIN	0	AC-FT	57290	

MAX DISCH: 350 CFS AT 13:45 ON May. 22,2009 GH 2.56 FT. SHIFT 0.03 FT.

MAX GH: 2.56 FT. AT 13:45 ON May. 22,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER
Water Year 2009

Location.--	Lat 39°40'45", long 105°54'12", manhole is located in the East Portal CDOT parking lot between the East and West bound lanes.
Drainage and Period of Record.--	Eisenhower Tunnel seepage with effluent from sewage treatment facility.
Equipment.--	A 12 inch Parshall flume located in a manhole-vault in the CDOT parking lot between eastbound and westbound lanes of I-70. The tunnel pipeline is approximately 12 ft. underground. There is a condensing environment in the tunnel and the moisture has destroyed electronic and electrical equipment placed there previously. Most metal objects are corroded. The air is of possible poor quality within the tunnel, requiring confined space safety measures when the staff is read or measurements are made. A Sutron stage discharge recorder (SDR) was installed on Aug 1, 2007 to better monitor flow conditions in the tunnel and was placed in a NEMA enclosure mounted on the REW of the flume.
Hydrographic Conditions.--	This is considered to be a transmountain diversion from the Colorado River Basin. The flow is seepage and drainage from cleaning operations inside the Eisenhower Tunnel combined with the effluent from the CDOT facility sewage treatment plant. The source of the water supply for tunnel operations (and hence the wastewater portion of the tunnel water) is a small drainage immediate to the West Portal. However, a portion of the water is decreed to be non-tributary, so there are water rights administration issues involved.
Gage-Height Record.--	Primary record is hourly averages of 15-minute data from the SDR recorder. Recorder was checked against the staff on October 10, 2008, May 6, July 14 and October 7, 2009 and found to read correctly, with one recorder adjustment of +.01 ft made on May 6, 2009. There is no events log record for 7/14/09 through 9/30/09. The record is considered to be complete and reliable. Coors employees visited the gage six times during 2009, but did not record visit times. Coors readings' correlation to logged data during these days appeared to be OK—Coors readings were within the range of daytime SDR values on 5 of the 6 visits. But since visit times were not recorded and their staff reading technique has not been observed, it was not possible to give any weight to the Coors readings. The gage is not visited in the winter since the parking lot is covered with ice and snow. Water continues to run in the tunnel without ice affect. Confined space equipment (Oxygen tester & man-hoist) is used when taking readings.
Datum Corrections.--	Levels were run May 6, 2009. The gage was found to be reading within tolerance so no changes were made.
Rating.--	A standard 1-ft Parshall Flume table is used. The Parshall flume has a tendency to fill with mud and sand. Coors personnel are responsible for cleaning the flume when they visit. State hydrographers have begun visiting during the summer, downloading the log, measuring, and cleaning the flume. Three measurements were made this year, Nos. 6-8, with discharges of 0.21, 0.15 and 0.91 cfs. The peak flow of 1.84 cfs occurred at 2000 on June 5, 2009 at a gage height of 0.65 ft with a shift of -0.04 ft. It exceeded measurement #8, made July 14, by 0.18 ft. in stage.
Discharge.--	Nine total measurements have been made at the gage from August 1, 2007 to October 7, 2009. Shifts range from -0.05 to 0.00 ft. WY2009 measurements shows shifts of -0.01 ft, -0.03 ft and -0.04 ft. respectively. This argues for a time distribution of shifts, which is consistent with the flume and exit tunnel getting cleaner of sand as more State hydrographer visits are made. Shifts were distributed by time with consideration to stage from 5/6-10/7/09, and all shifts were given full weight. The accuracy of the measurements can only be considered fair, since the depths involved were at the lower limit for Pygmy meters. Also the range of flow is not well defined, since the highest measurement is 0.91 cfs, with peak flows in the range of 1.8 cfs.
Special Computations.--	
Remarks.--	The record is fair due to the accuracy and limited range of the measurements made. This record is requested by DWR Division 5 and the Upper Colorado River Commission to complete their accounting of transmountain diversions. Station maintained and record developed by Jana Ash.
Recommendations.--	A wireless modem linked with the SDR may allow readings to be put on the DWR streamflow website. (Satellite monitoring is not possible at this site since CDOT will not allow an antenna in the parking lot or attached to the side of their building.) A wider range of measurements will be required in the future to determine what might cause the shifts and if the flume has any permanent and/or variable shift conditions. A measurement made in June, when flows are highest, would be beneficial. If the results show that stage shifting is possible, then a second measurement made with a second meter to verify the results.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER

RATING TABLE--

STD01FTPf USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

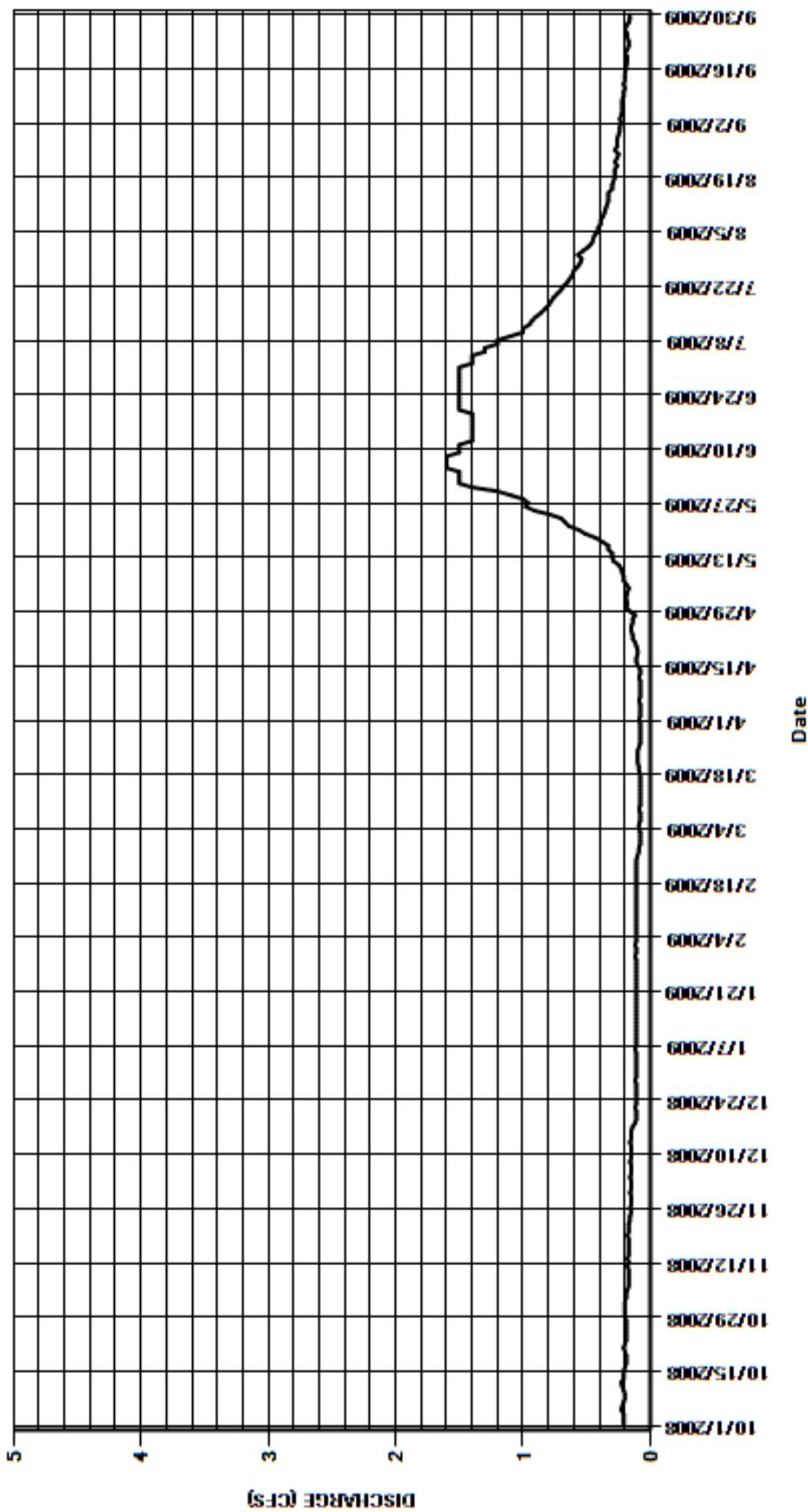
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.21	0.2	0.15	0.11	0.11	0.08	0.09	0.18	1.5	1.5	0.49	0.24
2	0.21	0.2	0.15	0.11	0.12	0.08	0.08	0.19	1.5	1.4	0.46	0.23
3	0.21	0.19	0.15	0.11	0.11	0.08	0.08	0.19	1.5	1.4	0.45	0.24
4	0.21	0.19	0.16	0.11	0.11	0.09	0.08	0.18	1.5	1.4	0.44	0.23
5	0.23	0.18	0.15	0.11	0.11	0.09	0.08	0.17	1.6	1.3	0.41	0.22
6	0.22	0.17	0.15	0.12	0.11	0.08	0.09	0.19	1.6	1.3	0.41	0.22
7	0.21	0.17	0.15	0.11	0.11	0.08	0.08	0.21	1.6	1.2	0.39	0.22
8	0.2	0.17	0.16	0.11	0.11	0.08	0.08	0.21	1.6	1.2	0.39	0.22
9	0.2	0.17	0.15	0.11	0.11	0.09	0.08	0.22	1.5	1.1	0.37	0.21
10	0.21	0.17	0.15	0.11	0.11	0.08	0.08	0.23	1.5	1	0.36	0.21
11	0.22	0.18	0.15	0.11	0.11	0.08	0.08	0.25	1.5	1	0.35	0.2
12	0.23	0.17	0.15	0.11	0.11	0.08	0.09	0.29	1.4	0.95	0.34	0.21
13	0.21	0.18	0.16	0.11	0.11	0.08	0.08	0.3	1.4	0.93	0.33	0.2
14	0.21	0.17	0.15	0.11	0.11	0.08	0.08	0.3	1.4	0.9	0.33	0.2
15	0.21	0.17	0.15	0.11	0.11	0.08	0.1	0.33	1.4	0.86	0.33	0.2
16	0.2	0.17	0.15	0.11	0.11	0.08	0.11	0.33	1.4	0.83	0.3	0.19
17	0.19	0.17	0.14	0.11	0.11	0.08	0.11	0.38	1.4	0.8	0.3	0.19
18	0.19	0.17	0.12	0.11	0.11	0.08	0.1	0.43	1.4	0.78	0.29	0.18
19	0.19	0.18	0.11	0.11	0.11	0.09	0.1	0.51	1.4	0.76	0.28	0.18
20	0.2	0.17	0.11	0.11	0.11	0.09	0.11	0.56	1.5	0.73	0.28	0.2
21	0.21	0.17	0.11	0.11	0.11	0.1	0.12	0.64	1.5	0.7	0.28	0.18
22	0.2	0.17	0.12	0.11	0.11	0.1	0.14	0.67	1.5	0.68	0.26	0.17
23	0.19	0.16	0.11	0.11	0.11	0.1	0.14	0.7	1.5	0.65	0.28	0.17
24	0.19	0.16	0.11	0.11	0.11	0.1	0.15	0.79	1.5	0.63	0.26	0.18
25	0.19	0.15	0.11	0.11	0.1	0.09	0.15	0.91	1.5	0.61	0.25	0.18
26	0.19	0.16	0.11	0.11	0.09	0.08	0.14	0.98	1.5	0.6	0.28	0.2
27	0.19	0.15	0.11	0.11	0.09	0.08	0.14	0.96	1.5	0.57	0.26	0.19
28	0.19	0.15	0.11	0.11	0.08	0.08	0.12	1	1.5	0.55	0.26	0.17
29	0.2	0.15	0.12	0.11	---	0.08	0.16	1.1	1.5	0.54	0.26	0.16
30	0.2	0.16	0.11	0.12	---	0.08	0.19	1.2	1.5	0.57	0.25	0.16
31	0.2	---	0.11	0.11	---	0.08	---	1.4	---	0.53	0.24	---
TOTAL	6.31	5.12	4.14	3.43	3.01	2.62	3.23	16.00	44.6	27.97	10.18	5.95
MEAN	0.2	0.17	0.13	0.11	0.11	0.085	0.11	0.52	1.49	0.9	0.33	0.2
AC-FT	13	10	8.2	6.8	6	5.2	6.4	32	88	55	20	12
MAX	0.23	0.2	0.16	0.12	0.12	0.1	0.19	1.4	1.6	1.5	0.49	0.24
MIN	0.19	0.15	0.11	0.11	0.08	0.08	0.08	0.17	1.4	0.53	0.24	0.16
CAL YR	2008	TOTAL	143.65	MEAN	0.39	MAX	1.8	MIN	0.11	AC-FT	285	
WTR YR	2009	TOTAL	132.56	MEAN	0.36	MAX	1.6	MIN	0.08	AC-FT	263	

MAX DISCH: 1.8 CFS AT 20:00 ON Jun. 05,2009 GH 0.65 FT. SHIFT -0.04 FT.

MAX GH: 0.65 FT. AT 20:00 ON Jun. 05,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER
WY2009 HYDROGRAPH



BLUE RIVER BASIN
09047300 VIDLER TUNNEL NEAR ARGENTINE PASS
Water Year 2009

Location.-- Lat. 39°37'28", Long. 105°47'28", sec.6, T.5 S., R.75 W., Summit County, at Argentine Pass above Keystone Ski Area.

Drainage and Period of Record.-- 1971 to present.

Equipment.-- Sutron SatLink 2 Data Collection Platform (DCP) with Shaft Encoder (SE), a Sutron Stage Discharge Recorder (SDR) mounted on a prefabricated steel three-foot Parshall flume. The flume is inside the tunnel, approximately 320 feet from the (DCP). The primary reference is the flume staff gage. Data is logged and transmitted by the DCP near the entrance of the tunnel.

Hydrographic Conditions.--

Gage-Height Record.-- Normally the primary record is hourly average gage heights taken from satellite telemetry with chart and the SDR. However the record for water year 2009 was taken from the SDR operated by the City of Golden, the gage cooperator. The satellite telemetry was not operated because of safety concerns with integrity of the tunnel. The record is complete and reliable except for the following periods: May 19, 2009, start up, May 20, 2009, relatively large (0.12 ft.) correction, May 23, 2009, 00:00 to 04:00, no data recorded, logger records power reset; August 8, 2009 shut down. Calibration was done by the City of Golden staff, who did not keep visit records. Corrections were determined from the SDR events log and copied to a visit sheet. Eight gage height corrections were made to SDR during the water year and applied to the record. The hours before and after start-up and shut-down on May 19 and August 8 were assumed to be zero. The May 20 correction (0.12 ft) was applied back to start-up time on May 19, but both days were considered estimated since there was no documentation from the City of Golden as to the source of the correction.

Datum Corrections.-- Levels were run on June 23, 2000. The staff gage was found to be correctly set with respect to the crest of the flume. Flume dimensions were found to be within close agreement of design parameters, although the floor at the crest does have some slope up towards the crest in the converging section. There is nearly one foot of getaway within 8 ft downstream of the exit of the flume. No datum corrections were made.

Rating.-- The control is a three foot steel Parshall flume. Rating table is a standard 3-foot Parshall flume table. (STD03FTPF). No measurements were made in WY2009. The last five measurements (Nos. 32 July 7, 2006 and 36 July 1, 2008) ranged in flow from 1.37 to 11.6 cfs. The measurement section width is 4.45 ft. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 3 ft Parshall Flume is 0.61 to 50.4 cfs. Anything above or below this range is outside the +/- 5% accuracy range. All flows during the 2009 water year were within this range during the operational period of the gage. The peak flow of 20.3 cfs occurred at 1815 on June 23, 2009 at a gage height of 1.45 ft with a shift of -0.05 ft. It exceeded measurement No. 36 made July 1, 2008 by 0.42 ft. in stage.

Discharge.-- Negative shifts are most likely caused by the floor of the flume sloping up towards the crest in the converging section of the Parshall flume. The last five measurements (Nos. 32 July 7, 2006 and 36 July 1, 2008) showed a shift of -0.05 ft. This shift was applied to this year's record. A notched index board is installed on the flume to insure current meter measurement sections are consistent.

Special Computations.-- The missing hours on May 23 were estimated from interpolation to adjacent odd record. Very little range in stage was observed, so May 23 is considered fair.

Remarks.-- The record is considered good, except for May 19 and 20 which are considered estimated due to a large calibration correction, and May 23 which is fair due to 4 hours of missing data. Record developed by Mike Wild.

Recommendations.-- Perform inspection of tunnel remediation work completed in 2009 by mining engineer. Improve the electrical grounding for DCP to eliminate electrical surges resetting encoder and seal enclosure to prevent damage to equipment cause by rodents. The SDR should not have required so many corrections. The source of the corrections should be investigated and Golden's visit procedures audited.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09047300 VIDLER TUNNEL NEAR ARGENTINE PASS

RATING TABLE--

STD03FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	9.1	14	3.6	0
2	0	0	0	0	0	0	0	0	7.8	14	3.4	0
3	0	0	0	0	0	0	0	0	8.1	15	3.3	0
4	0	0	0	0	0	0	0	0	8.8	12	3.1	0
5	0	0	0	0	0	0	0	0	9.1	11	2.9	0
6	0	0	0	0	0	0	0	0	9.2	10	2.9	0
7	0	0	0	0	0	0	0	0	8.3	10	2.2	0
8	0	0	0	0	0	0	0	0	7.3	10	0	0
9	0	0	0	0	0	0	0	0	6.9	9.5	0	0
10	0	0	0	0	0	0	0	0	6.4	8.7	0	0
11	0	0	0	0	0	0	0	0	5.8	8.6	0	0
12	0	0	0	0	0	0	0	0	5.3	8	0	0
13	0	0	0	0	0	0	0	0	6.7	7.9	0	0
14	0	0	0	0	0	0	0	0	7.6	7.6	0	0
15	0	0	0	0	0	0	0	0	6.9	7.2	0	0
16	0	0	0	0	0	0	0	0	7	6.6	0	0
17	0	0	0	0	0	0	0	0	9.1	6	0	0
18	0	0	0	0	0	0	0	0	11	5.6	0	0
19	0	0	0	0	0	0	0	0	1.8	13	5.4	0
20	0	0	0	0	0	0	0	0	5.5	14	5.2	0
21	0	0	0	0	0	0	0	0	6.6	14	4.8	0
22	0	0	0	0	0	0	0	0	5.7	14	4.3	0
23	0	0	0	0	0	0	0	0	5.5	17	4.1	0
24	0	0	0	0	0	0	0	0	5.5	18	3.8	0
25	0	0	0	0	0	0	0	0	5.7	17	3.7	0
26	0	0	0	0	0	0	0	0	5.4	17	3.8	0
27	0	0	0	0	0	0	0	0	5.4	17	3.4	0
28	0	0	0	0	0	0	0	0	6	15	3.2	0
29	0	0	0	0	---	0	0	0	6.8	14	3.1	0
30	0	0	0	0	---	0	0	0	7.4	14	4.5	0
31	0	---	0	0	---	0	0	---	9.7	---	3.9	0
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.00	324.4	224.9	21.40	0.00
MEAN	0	0	0	0	0	0	0	2.48	10.8	7.25	0.69	0
AC-FT	0	0	0	0	0	0	0	153	643	446	42	0
MAX	0	0	0	0	0	0	0	9.7	18	15	3.6	0
MIN	0	0	0	0	0	0	0	0	5.3	3.1	0	0

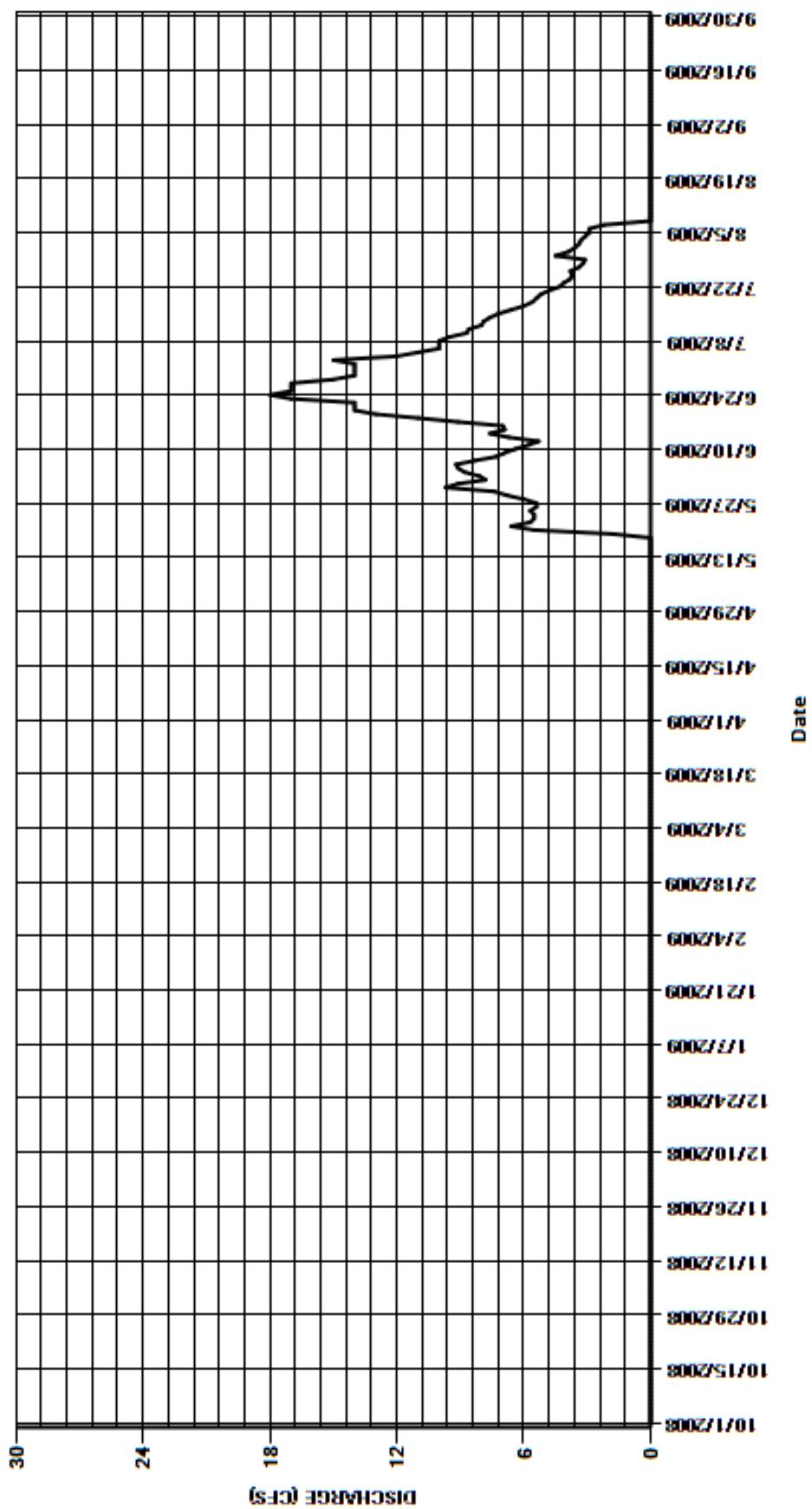
CAL YR	2008	TOTAL	534.30	MEAN	1.46	MAX	13	MIN	0	AC-FT	1060
WTR YR	2009	TOTAL	647.70	MEAN	1.77	MAX	18	MIN	0	AC-FT	1280

MAX DISCH: 20.3 CFS AT 18:15 ON Jun. 23,2009 GH 1.45 FT. SHIFT -0.05 FT.

MAX GH: 1.45 FT. AT 18:15 ON Jun. 23,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09047300 VIDLER TUNNEL NEAR ARGENTINE PASS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

AUGUST P. GUMLICK TUNNEL aka JONES PASS TUNNEL RELEASE TO CLEAR CREEK

Water Year 2009

Location.--	Situated in the Platte River Basin, the tunnel is located on the Williams Fork River, which flows into the Colorado River. The tunnel is situated between the head gate on the right bank of Bobtail Creek in Section 28, Township 3S, Range 76W, and the head gate on the left bank of McQueary Creek in Section 16, to the West Fork of Clear Creek in Section 24 in the South Platte River basin. Since July, 1959, Gumlick water has been diverted into Vasquez Tunnel to Vasquez Creek in Section 1, Township 3S, Range 76W, in the Frazier River and Colorado River basins. Delivery through the 10 ft. Parshall into Clear Creek since the completion of Vasquez Tunnel in 1958 has been rare.
Drainage and Period of Record.--	WY2006 is first year of published record.
Equipment.--	The gage has a weekly Stevens F-Type graphic stage recorder. A stage discharge recorder was installed in 2009 after the flume was shut down for the year. The flume is a covered 10 Ft. Parshall flume with 5 ft. walls, in a square concrete shelter and stilling well. The well is connected to the flume with a single 2" inlet set across from the staff. The gage was set to the staff, in 2009, but a new RP and tape were installed this year for use in 2010. A supplemental staff is in the stilling well
Hydrographic Conditions.--	Diversion is from tributaries of the Williams Fork river in the Colorado River basin between the head gate on the right bank of Bobtail Creek in Sec. 28, T. 3S, R. 76W., and the head gate on the left bank of McQueary Creek in Sec. 16, to the West Fork of Clear Creek in Sec. 24 in the South Platte River basin. Since July, 1959, Gumlick water has been redirected into Vasquez Tunnel to Vasquez Creek in Sec. 1, T. 3S. , R. 76W, in the Frazier River and Colorado River basins. Delivery through the 10 ft. Parshall into Clear Creek since the completion of Vasquez Tunnel in 1958 has been rare.
Gage-Height Record.--	The record is chart based and the recorder is maintained by Denver Water. The record is complete and reliable with no missing data. Hourly GH's were estimated from the chart and entered into a records spreadsheet. The chart GH differed from the staff by 0.02 ft when the gage was visited and the release measured by a State hydrographer. At other times the chart setting was questionable, the chart having been set when the GH was zero. Several small changes called 'resets' were made on the chart without stating if the change was a pen correction or a gate adjustment. The changes were assumed to be gate adjustments. One of these 'resets' occurred right after the peak GH was recorded on June 19, so the peak discharge was considered fair for record purposes. (Other peaks without 'reset' issues were recorded that were within a fair percentage of the June 19 peak.)
Datum Corrections.--	Levels were run to the outside staff on July 29, 2009, using the average flume crest as zero. The staff was found to read 0.07 ft low. No correction was made, since the outside staff will no longer be used as the primary reference after this year. Datum of gage is 10.312.5 ft. (Levels are run by the City of Denver).
Rating.--	A standard 10-ft Parshall Flume rating table was used. One measurement (No. 2) was made this year. The peak flow of 22.8 cfs occurred at 1100 on June 19, 2009 at a gage height of 0.57 ft with a shift of +0.14 ft.
Discharge.--	Shifting was caused by approach conditions and by the staff reading 0.07 ft low. Depth (.58 to .65 ft) and velocity (.38 to 3.20 fps) gradients were observed across the flume. This could be due to the fact that water is discharged into the Clear Creek at an angle from August P. Gumlick Tunnel. The +0.14 shift obtained from Measurement No. 2 was applied to the entire record. Gate conditions were not documented, although it was inferred that the release was not under pressure since the Tunnel was not delivering water back to the west slope. There is also some potential for stage shifting since the only other measurement made shows a +0.07 shift at a higher flow. The flume stage was fairly constant throughout the release. It is reasonable to assume that flume conditions remained constant and that the +0.14 shift could be used for the entire record. Due to the flume cover, only wading measurements are possible, and the flume can only be entered by wading from the downstream end.
Special Computations.--	Hand computed gage heights from the chart.
Remarks.--	Water was released for 13 days in 2009. The record is considered good, except for the peak discharge, which is fair due to questionable chart setting. Record developed by Jana Ash.
Recommendations.--	Flume conditions should be discussed with Denver Water Resources. If the flume is ever operated with the release under pressure or at various release levels, then a range of measurements will be needed to get good record. The flow conditions observed are very likely to change with stage. Hydrographers should be present at start-up next year to set the SDR and make sure that the gage operator understands that the chart should be set to the new tape. It would also be good to take readings of the stilling well staff on each visit to assess its usefulness. Photos should be taken of flow conditions in the flume. Measurement notes should include observations about the gate opening and whether flow is running through the A. P. Gumlick Tunnel 15 ft. flume. The water is being released to Golden, and Will Stambaugh with Golden seems to have more knowledge about release plans than Denver does. He should be consulted at the beginning of the summer.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

AUGUST P. GUMLICK TUNNEL aka JONES PASS TUNNEL RELEASE TO CLEAR CREEK

RATING TABLE--

STD10FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	11	0	0	0
19	0	0	0	0	0	0	0	0	17	0	0	0
20	0	0	0	0	0	0	0	0	18	0	0	0
21	0	0	0	0	0	0	0	0	19	0	0	0
22	0	0	0	0	0	0	0	0	15	0	0	0
23	0	0	0	0	0	0	0	0	20	0	0	0
24	0	0	0	0	0	0	0	0	18	0	0	0
25	0	0	0	0	0	0	0	0	16	0	0	0
26	0	0	0	0	0	0	0	0	16	0	0	0
27	0	0	0	0	0	0	0	0	15	0	0	0
28	0	0	0	0	0	0	0	0	18	0	0	0
29	0	0	0	0	---	0	0	0	12	0	0	0
30	0	0	0	0	---	0	0	0	11	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	206.00	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	6.87	0	0	0
AC-FT	0	0	0	0	0	0	0	0	409	0	0	0
MAX	0	0	0	0	0	0	0	0	20	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

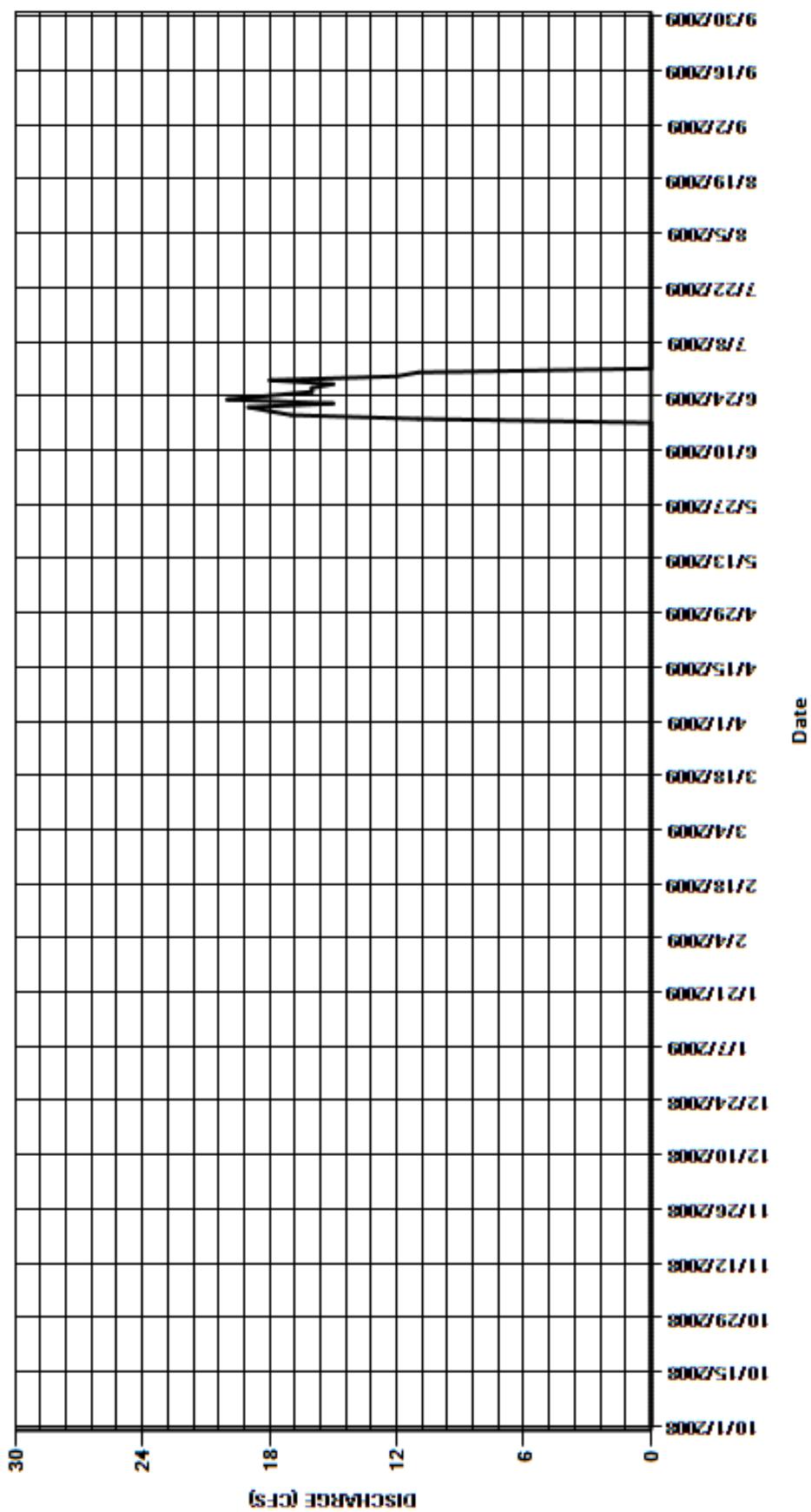
CAL YR	2008	TOTAL	594.00	MEAN	1.62	MAX	57	MIN	0	AC-FT	1180
WTR YR	2009	TOTAL	206.00	MEAN	0.56	MAX	20	MIN	0	AC-FT	409

MAX DISCH: 22.8 CFS AT 11:00 ON Jun. 19,2009 GH 0.57 FT. SHIFT 0.14 FT.

MAX GH: 0.57 FT. AT 11:00 ON Jun. 19,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

AUGUST P. GUMLICK TUNNEL AKA JONES PASS TUNNEL RELEASE TO CLEAR CREEK
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS
Water Year 2009

Location.-- Lat. 39°47'56", Long. 105°46'36"; Berthoud Pass Ditch diverts water from tributaries of Fraser River between headgate in sec. 33, T. 2 S., R. 75 W., Grand County, and Berthoud Pass, in Colorado River basin, to Hoop Creek, tributary to west fork Clear Creek in sec. 10, T. 3 S., R. 75 W., in Platte River Basin.

Drainage and Period of Record.-- July 1932 to present.

Equipment.-- Satlink data collection platform (DCP), shaft encoder in a 42-inch metal shelter and well at a 30 inch by 9 ft. cutthroat flume. The stilling well has been divided to accommodate a Ha and Hb well. Primary reference gage is a drop tape from an RP, and a supplemental Hs staff gage. There is reference for Hb. The gage is owned and operated by the city of Northglenn. The gage operates at a 2.50-ft. by 9-ft. cutthroat flume, but after 2007 the flume was no longer the control. Construction was done at the gage in October-November 2007 to cover the ditch. Prior to construction, snow-plows and traffic would drop debris into the ditch. The incoming ditch itself was replaced with a 36 inch Corrugated Metal Pipe and the flume was covered with metal sheets. An extra foot of concrete was also added to the walls of the flume, extending them from 3 ft. to 4 ft. height. The exiting ditch was replaced with a 36 inch Corrugated Plastic Pipe. Extensive dirt work was done around the area.

Hydrographic Conditions.-- The ditch drainage is nearly above tree line and is adjacent to a ski area. The ditch runs parallel to US highway 40 for part of its length and acts to divert snowmelt away from the uphill side of the road.

Gage-Height Record.-- The record is hourly averages of 15-minute transmitted data with DCP log as backup. The record is complete and reliable. Encoder adjustments of -0.01 ft were made to the record as indicated by the visit log. Water was run from June 3 to September 18, 2009. Hydrographers were present at both start-up and shut down.

Datum Corrections.-- The RP and tape were established with respect to the throat of the flume on June 20, 1989. Levels were run on October 9, 2008 and the gage was found to be reading 0.04 ft low. The RP was adjusted back to the 6.630 original height. Movement was possibly caused by construction. A datum correction of +.04 ft was applied to all gage heights in water year 2008. Levels were run again on July 14, 2009 and again on November 10, 2009. The gage was found to be reading within allowable tolerance in both instances. Also, the Ha tape gage and the staff gage were reading the same throughout the year, as was the case last year. Therefore, there is still a question with the measurement results in relation to the gage heights, as this year's measurements seem to be 0.04 ft different from last year's measurements. More measurements are needed to verify the rating.

Rating.-- Prior to 2008, the control was a 2.50-ft. by 9-ft. cutthroat flume, which used a standard cutthroat rating (BERDITCO01). Pipe-lining the ditch negated the control of the flume. The exit pipe is 0.04 ft higher than the flume throat and acts as a control, keeping the flume submerged. Rating No. 2 was developed in water year 2008 and is based on seven measurements (Nos. 112-118), ranging from 0.82 to 7 cfs. Eight measurements (Nos. 119-126) were made this year ranging in discharge from 0.36 to 6.13 cfs. The peak flow of 11.6 cfs occurred at 1630 on July 3, 2009 at a gage height of 1.39 ft (gage height correction of -0.01 ft applied) with a shift of +0.09 ft. It exceeded measurement No. 121 by 0.37 feet in stage.

Discharge.-- Flume remained clear of debris throughout the year. The ditch was also well maintained this year, and free of obvious obstructions during measurements. Shifts were consistently positive, but followed the rating curve slope. Shifts ranged from +0.04 to +0.09 ft. The reason for the positive shifts is unknown, although could be freeze-thaw movement of the culvert below the flume. More information is needed from next year to draw a more accurate conclusion. Shifts were distributed by time. Measurements 120-122, covering the high flows, did show a correlation with stage. The highest GH's had the highest shifts. But the stage shift graph did not have enough range to justify using stage shifts. Consideration to stage was given by using the highest shift (+0.09 ft) made on June 30 for the period June 24 to July 9. This allowed the majority of the high flow period to be covered by the highest shift, while still allowing some time shifting overall. June 24 and July 9 were not event days and choice of these days does not imply some physical shift mechanism.

Special Computations.-- Since the peak flow of 11.6 cfs exceeded 150% (6.18 cfs, meas. No. 121) of the highest rating measurement, the peak is considered an estimate.

Remarks.-- The record is considered good, except for the peak, which is considered poor. Station maintained and record developed by Jana Ash.

Recommendations.-- Visits should be continued every two weeks throughout the 2010 WY to ensure the flume is clear and to get a more accurate record. Higher flow measurements should be sought to extend the rating. 2009 measurements were consistently positive, therefore more measurements in 2010 will determine if a new rating is needed. From levels and measurement depths in 2008, it can be inferred that the staff now reads 0.04 ft higher than the tape. This was not the case in 2009, and levels run on 11/10/09 verified that the staff and tape were reading within +/- .01 ft. The reason for this is still a question and more data next year will help stabilize the rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS

RATING TABLE--

BERDITCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

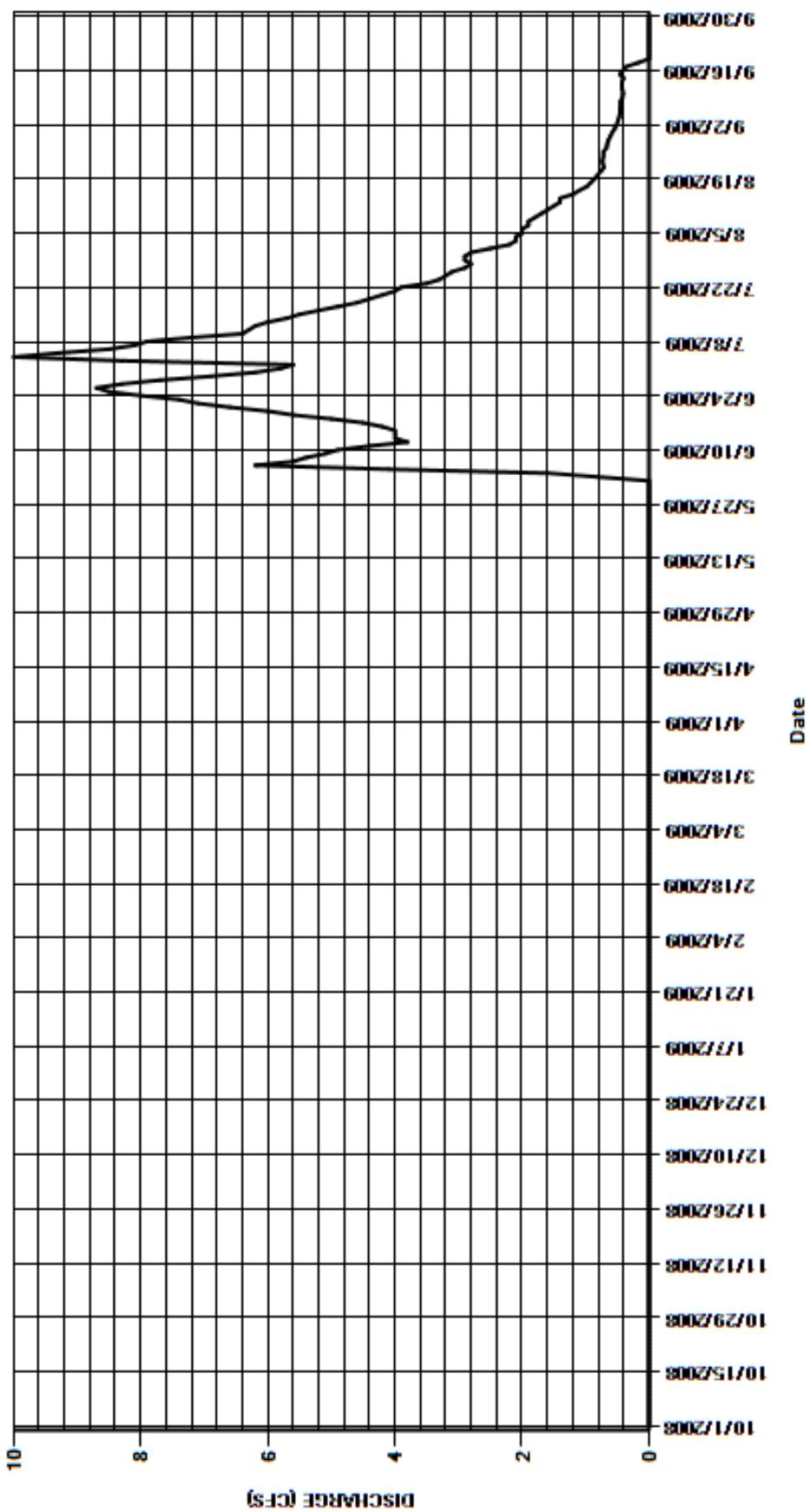
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	5.8	2.5	0.54
2	0	0	0	0	0	0	0	0	0	5.6	2.2	0.51
3	0	0	0	0	0	0	0	0	0.8	8.3	2.1	0.49
4	0	0	0	0	0	0	0	0	1.6	10	2.1	0.47
5	0	0	0	0	0	0	0	0	4.1	9.3	2	0.46
6	0	0	0	0	0	0	0	0	6.2	8.5	2	0.46
7	0	0	0	0	0	0	0	0	5.6	8.1	1.9	0.45
8	0	0	0	0	0	0	0	0	5.4	7.9	1.9	0.45
9	0	0	0	0	0	0	0	0	5.1	7.2	1.8	0.42
10	0	0	0	0	0	0	0	0	4.9	6.4	1.7	0.41
11	0	0	0	0	0	0	0	0	4.4	6.3	1.6	0.42
12	0	0	0	0	0	0	0	0	3.8	6.2	1.5	0.43
13	0	0	0	0	0	0	0	0	4	6	1.4	0.43
14	0	0	0	0	0	0	0	0	4	5.7	1.4	0.4
15	0	0	0	0	0	0	0	0	4	5.5	1.2	0.46
16	0	0	0	0	0	0	0	0	4.2	5.2	1.1	0.41
17	0	0	0	0	0	0	0	0	4.5	4.9	0.98	0.36
18	0	0	0	0	0	0	0	0	5	4.6	0.92	0.17
19	0	0	0	0	0	0	0	0	5.6	4.4	0.86	0
20	0	0	0	0	0	0	0	0	6	4.2	0.81	0
21	0	0	0	0	0	0	0	0	6.6	4	0.76	0
22	0	0	0	0	0	0	0	0	7.1	3.9	0.71	0
23	0	0	0	0	0	0	0	0	7.4	3.5	0.73	0
24	0	0	0	0	0	0	0	0	8	3.3	0.73	0
25	0	0	0	0	0	0	0	0	8.5	3.2	0.72	0
26	0	0	0	0	0	0	0	0	8.7	3.1	0.72	0
27	0	0	0	0	0	0	0	0	8.3	2.9	0.67	0
28	0	0	0	0	0	0	0	0	7.7	2.8	0.66	0
29	0	0	0	0	---	0	0	0	6.9	2.9	0.64	0
30	0	0	0	0	---	0	0	0	6.2	2.9	0.61	0
31	0	---	0	0	---	0	---	0	---	2.8	0.58	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	154.60	165.4	39.50	7.74
MEAN	0	0	0	0	0	0	0	0	5.15	5.34	1.27	0.26
AC-FT	0	0	0	0	0	0	0	0	307	328	78	15
MAX	0	0	0	0	0	0	0	0	8.7	10	2.5	0.54
MIN	0	0	0	0	0	0	0	0	0	2.8	0.58	0

CAL YR	2008	TOTAL	354.33	MEAN	0.97	MAX	8.5	MIN	0	AC-FT	703
WTR YR	2009	TOTAL	367.24	MEAN	1.01	MAX	10	MIN	0	AC-FT	728

MAX DISCH: 11.4 CFS AT 16:30 ON Jul. 03,2009 GH 1.39 FT. SHIFT 0.09 FT. (GH CORR. OF -0.01 FT APPLIED)
 MAX GH: 1.39 FT. AT 16:30 ON Jul. 03,2009 (GH CORR. OF -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
09022500 MOFFAT WATER TUNNEL AT EAST PORTAL
Water Year 2009

Location.--	Lat. 39°54'07", Long. 105°38'44"; diverts water from tributaries of William's Fork River and main stem and tributaries of Fraser River in Colorado River basin, to South Boulder Creek, in sec. 2, T.2 S., R.74 W., in Platte River basin, Gilpin County.
Drainage and Period of Record.--	June 1936 to present.
Equipment.--	Graphic water stage recorder (weekly) and high data rate satellite telemetry (Sutron 8210 DCP with a Satlink 2 transmitter and a phone modem) in a timber shelter with a concrete stilling well at a 15 foot Parshall Flume. Flume is equipped with a staff. Primary reference is an electric tape gage. Gage has AC power and a heater is used to keep the well open in the winter.
Hydrographic Conditions.--	The flow is collected from diversions on Vasquez, Frazier-Jim, and Ranch Creeks in the Winter Park area, as well as some water imported from other drainages. Water is collected year-round and will show diurnal variations.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with chart backup. The record is complete and reliable, except for the following periods. January 27 (0800) to January 28 (0800), no gage height record due to DCP failure. Chart record was not available from Denver for this period, but Denver spreadsheets based on chart record were available for discharge estimation. December 4-10, the gage height was unreliable, due to possible ice in well (heater not activated for winter season). Chart shows some movement and good record in December is mostly flat anyway. Record was used but the accuracy discounted. The stage discharge relationship generally does not become ice-affected as the water is still warm from the tunnel. The well, however, will freeze in extreme temperatures if heat lamp or space heater are not turned on or adjusted correctly. The DCP logged values sporadically from Oct. 23-28. The cause was not determined and the problem corrected itself. The missing data values were obtained from the chart without loss of accuracy. The chart is changed weekly by Denver Water Department, who has been asked to report on encoder errors. The primary data vs. chart max/min times did not always match, primarily due to inaccurate starting set points in both stage and time on the chart. However, the chart usually agreed within 0.02 ft in stage and/or 2 hours from primary data. Pen and time corrections were made when filling in missing satellite data. During September 9-30 the tunnel was shut down for maintenance and Denver reported zero flow. Residual gage heights of 0.05 ft and less were recorded during this period. These residuals were either standing water in the well, or seepage that was not an active diversion. Gage heights of 0.05 ft or less were considered as zero flow.
Datum Corrections.--	Levels were last run on Jan 6 and August 16, 2006. The gage was found to read correctly both dates.
Rating.--	Control is a standard 15 foot Parshall Flume. Get-away conditions are good; submergence of the control is not a problem. Moss historically builds during the fall and winter months. A standard 15-foot Parshall rating, STD15FTP, was used this year. Fifteen measurements (No's. 609-623) were made this water year, ranging in discharge from 7.08 to 675 cfs. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 15 ft Parshall Flume is 8 to 600 cfs. Anything above or below this range is outside the +/- 5% accuracy range unless defined by measurements. There were only a few days with mean daily flows less than 7.08 cfs. Daily mean flows higher than 675 cfs occurred on May 21, 24, 25, 2009. The peak flow of 801 cfs occurred at 2100 on May 23, 2009 at a gage height of 5.02 ft with a shift of 0.15 ft. It exceeded measurement no. 619 by 0.59 ft in stage.
Discharge.--	Shifting control method was used all year. The flume is in good condition but negative shifts can be caused by rocks deposited in the approach canal and flume and by moss build-up in the flume. Higher flows come into the flume with substantial approach velocity, and with faster velocities and deeper depths on the gage side—this leads to positive shifts at higher flows. Special shift distributions are used when flume cleaning changes the shift and staff readings in the flume before and after cleanings. Shifts were distributed by both time and stage. Measurements show unadjusted shifts varying from -0.04 to + 0.21 ft. From October 1 to October 27, 2008, variable stage shift table MOFTUNCOVST01 was used. Measurements Nos. 598 thru 608 (except No. 606) made in WY08 and Nos. 609-610 made in WY09 were used to create the table. All measurements were given full weight except Nos. 600, 607, 610, which were each adjusted 2%. Shifts were distributed by time proration from October 27, 2008 to March 4, 2009. This period has very little variation in stage. The build-up of moss, over time, in the flume can also be a factor at lower GH's. The shifts during this period also only vary slightly. Some shifts have been adjusted (Nos. 611, 615) 3-5% to transition better though the period. From March 4 to September 30, 2009, variable stage shift table MOFTUNCOVST02 was used. This period contains most of the year's activity of variation in gage height. The peak flow is also contained within this period. Measurement Nos. 616 to 623 were made during the period. Measurements 616, 620, and 622 were given full weight. Msmt Nos. 617, 618, 619, 621,623 were adjusted 3-4% to smooth shift distribution. High measurement No. 619 for WY2009 was discounted in favor of high flow measurements made in previous years because the measurement depths were higher than in past measurements at similar gage heights. In addition to including all measurements made during the period of use, table MOFTUNCOVST02 uses measurements 601 and 602 from 2008 and measurement 533 from 2003.
Special Computations.--	Discharge was estimated for January 27 (0800) to January 28 (0800) (no record) from Denver spreadsheets. Accuracy is considered fair since Denver's figures are presumed to be based on chart record which was later misplaced. Record was used for December 4-10 when there was possible ice in the well. The accuracy is considered fair since flow was relatively constant in December and the discharges showed good agreement with Denver's spreadsheets.
Remarks.--	Record is good, except for December 4-10, and January 27-28 which are fair. Station maintained and record developed by Patrick Tyler.

Recommendations.--

The bottom of flume should be cleaned on a regular basis. Steps should be installed into the side of the canal above the flume. A non-standard rating for the flume is possible at the high end if enough measurements can be made.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09022500 MOFFAT WATER TUNNEL AT EAST PORTAL

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

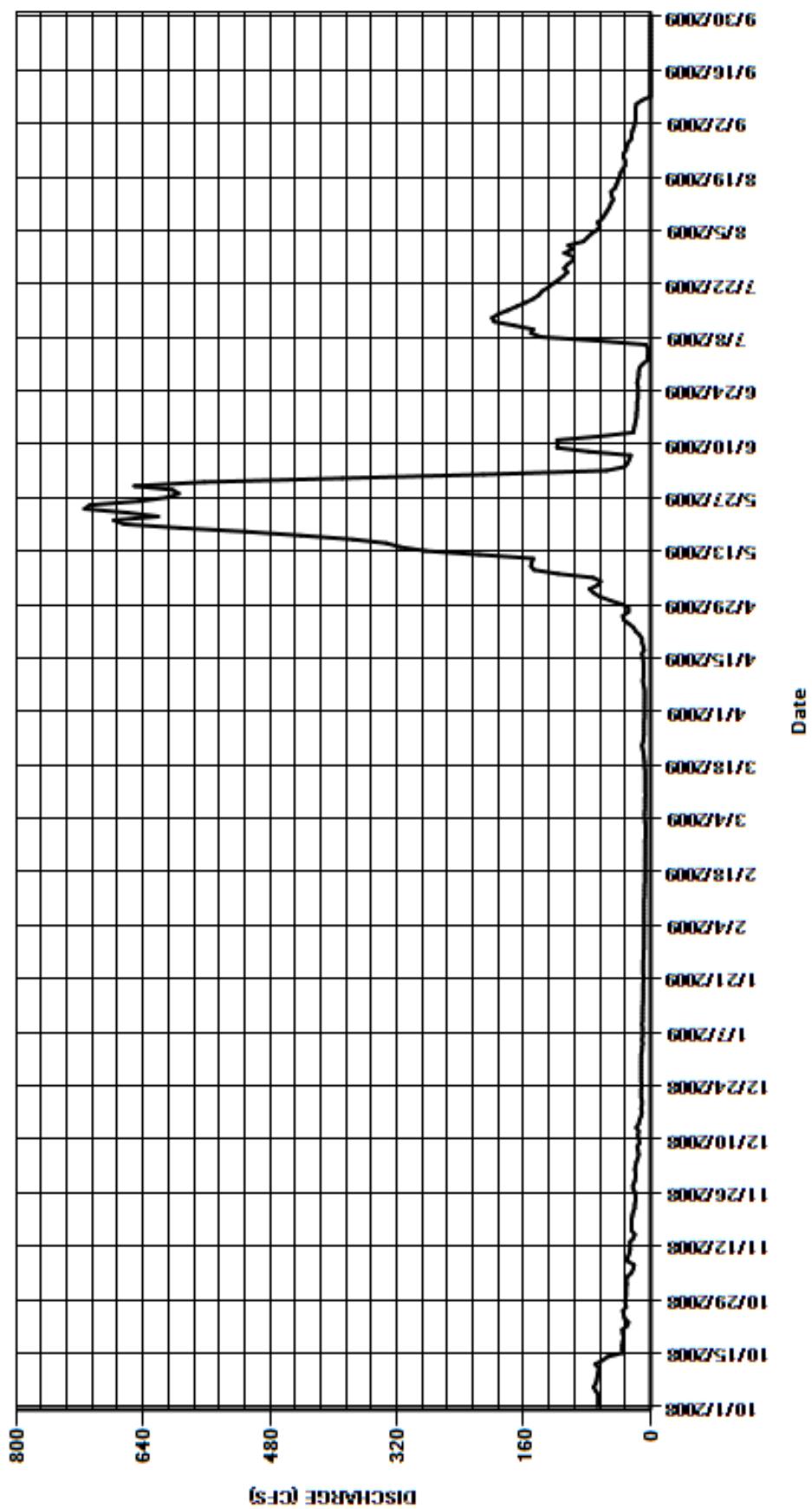
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	31	19	12	8.4	6.3	8	64	389	9.7	104	21
2	66	30	20	11	8.2	6.4	7.7	72	211	3.5	85	20
3	66	31	19	11	8.2	7	7.7	77	56	3.7	80	19
4	66	29	18	10	8.1	7.5	7.6	67	33	3.5	75	19
5	69	24	16	11	8.2	7.6	7.3	63	29	3.3	68	19
6	72	22	15	10	8.3	7.4	7.4	73	27	6.2	64	19
7	69	21	16	10	8.2	7.1	7.9	117	25	66	67	18
8	68	29	17	10	8.2	7.1	9	147	78	138	61	11
9	67	29	14	11	8.1	7.2	10	151	118	151	58	0
10	66	27	15	10	8.1	6.6	8.9	150	117	148	55	0
11	65	26	16	10	8	6.9	8.7	148	118	172	52	0
12	70	26	15	10	7.6	6.8	8.9	216	64	197	50	0
13	61	26	18	9.9	7.8	6.8	8.7	284	22	200	47	0
14	54	22	15	9.9	7.5	6.7	9.3	316	21	192	49	0
15	35	20	14	9.8	7.4	6.7	9.7	333	20	180	50	0
16	36	24	12	9.3	7.2	6.8	11	375	19	169	45	0
17	36	24	11	9.3	7.4	7.3	8.3	441	18	158	43	0
18	35	24	12	9.2	7.2	7.7	9.2	509	18	148	41	0
19	34	24	11	9.3	7.1	7.8	11	593	17	141	39	0
20	35	23	11	9.3	6.7	8.5	11	664	17	137	38	0
21	36	22	12	9	7.1	8.8	14	677	17	129	35	0
22	30	20	12	9.2	6.8	10	19	621	16	123	32	0
23	28	20	12	9.2	6.7	11	22	660	16	116	32	0
24	33	19	11	9.3	6.8	9.4	28	714	16	110	34	0
25	34	19	12	9.3	6.8	8.9	34	707	16	105	34	0
26	35	20	12	9.2	7.1	8.3	35	645	17	109	31	0
27	31	22	12	9	6.5	8.5	28	609	16	105	30	0
28	32	22	12	9	6.1	8.4	28	595	15	98	28	0
29	32	20	12	8.3	---	8.4	36	603	15	97	24	0
30	31	19	12	8.5	---	8	51	651	14	109	24	0
31	31	---	12	8.5	---	7.8	---	563	---	98	23	---
TOTAL	1490	715	435	300.5	209.8	239.7	472.3	11905	1575	3425.9	1498	146.00
MEAN	48.1	23.8	14	9.69	7.49	7.73	15.7	384	52.5	111	48.3	4.87
AC-FT	2960	1420	863	596	416	475	937	23610	3120	6800	2970	290
MAX	72	31	20	12	8.4	11	51	714	389	200	104	21
MIN	28	19	11	8.3	6.1	6.3	7.3	63	14	3.3	23	0
CAL YR	2008	TOTAL	35692.0	MEAN	97.5	MAX	800	MIN	5.2	AC-FT	70800	
WTR YR	2009	TOTAL	22412.20	MEAN	61.4	MAX	714	MIN	0	AC-FT	44450	

MAX DISCH: 801 CFS AT 21:00 ON May. 23,2009 GH 5.02 FT. SHIFT 0.15 FT.

MAX GH: 5.02 FT. AT 21:00 ON May. 23,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09022500 MOFFAT WATER TUNNEL AT EAST PORTAL
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW
Water Year 2009

Location.--	Lat 40°19'40", long 105°34'39", in NW 1/4 sec. 9, T.3 N., R.75 W., Larimer County on right bank at upstream end of Aspen Creek Siphon, 700 ft. below east portal, and 4.5 mi. southwest of Estes Park. Alva B, Adam's Tunnel At East Portal is a transbasin diversion conveying waters tributary to the Colorado River to the Big Thompson basin which can be further conveyed to the Cache La Poudre, Boulder Creek and South Platte River drainages.
Drainage and Period of Record.--	ADANETCO (West Slope Water only) published since 2000. Adams Tunnel (ADATUNCO) published since 1948, includes small amounts of east slope water that enter the ADATUNCO stilling basin.
Equipment.--	Alva B. Adam's Net (ADANETCO) is a computed record. This record is comprised of data obtained from Alva B. Adam's Tunnel Near Estes Park, CO (ADATUNCO), Wind River Near Estes Park, CO (WINDESCO) and Wind River Bypass Below Adam's Tunnel Near Estes Park, CO (WINBYPSCO). See individual records for individual station equipment.
Hydrographic Conditions.--	Alva B. Adam's Tunnel is a transmountain water diversion operated by the United States Bureau of Reclamation (USBR) as a component of the Colorado Big Thompson Project (C-BT). Water is captured through various structures and reservoirs on the west slope and transported to the east slope via Adam's Tunnel. The tunnel empties into a stilling reservoir before entering the ADATUNCO flume. This stilling reservoir can intercept native east slope flow from Wind River for power generation throughout the C-BT system an operation called "skimming"; or the Wind River flow can be bypassed under the stilling reservoir. Wind River is gaged upstream of the reservoir at WINDESCO and again below ADATUNCO at the WINBYPSCO gage. Wind River water is skimmed into the C-BT system during peak runoff periods of the summer when Wind River flows are in excess of 2 cfs. Skimmed water is determined from the difference of Wind River Above Adam's Tunnel (WINDESCO) and Wind River Below Adam's Tunnel (WINBYPSCO). Skimming operations occurred between May 7, 2009 (11:00) and July 15, 2009 (08:00).
Gage-Height Record.--	See gage height record for individual gages: WINDESCO, WINBYPSCO and ADATUNCO. The peak gage-height, as recorded by ADATUNCO of 4.18 feet occurred on December 21, 2008 (11:30) while skimming operations were not actively occurring.
Datum Corrections.--	Computed record. See individual gage station analyses.
Rating.--	Computed record. See individual gage station analyses.
Discharge.--	Computed record. See special computations section for discharge computations. The peak did not occur during skimming operations. As such, the peak computed discharge recorded at the ADATUNCO gage will equal the computed peak discharge for this record. . The peak discharge of 570 cfs occurred at 1130 on December 21, 2008 at a gage height of 4.18 ft with a shift of 0.00 ft.
Special Computations.--	Discharge, for the ADANETCO gage is determined by calculating the amount of skimmed Wind River water moved through the ADATUNCO structure, then subtracting that amount from the ADATUNCO record on days when skimming occurred. Thus, $\text{ADANETCO} = \text{ADATUNCO} - (\text{WINDESCO} - \text{WINBYPSCO}).$ Skimming operations occurred from May 7, 2009 (11:00) through July 15, 2008 (08:00).
Remarks.--	This a computed record. "Skimming" operations as noted by the USBR water order 09-219 and provided USBR daily accounting sheets occurred from May 7, 2009 (11:00) through July 15, 2009 (08:00). The ADATUNCO, WINDESCO, and WINBYPSCO records are considered good during the skim period. For non-skim periods the record is rated as per the ADATUNCO record: Good for the entire year. Zero flow is determined operationally. Small residuals draining through the flume after the tunnel was turned off were considered to be zero, since skimming was not occurring during these periods. Zero flow occurred on part of the day or all day on the following days: October 31, 2008; November 1-19, 23-26, 28-30, 2008; December 1-3, 6-9, 2008. Station maintained by USBR and DWR personnel and record developed by Russell Stroud.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

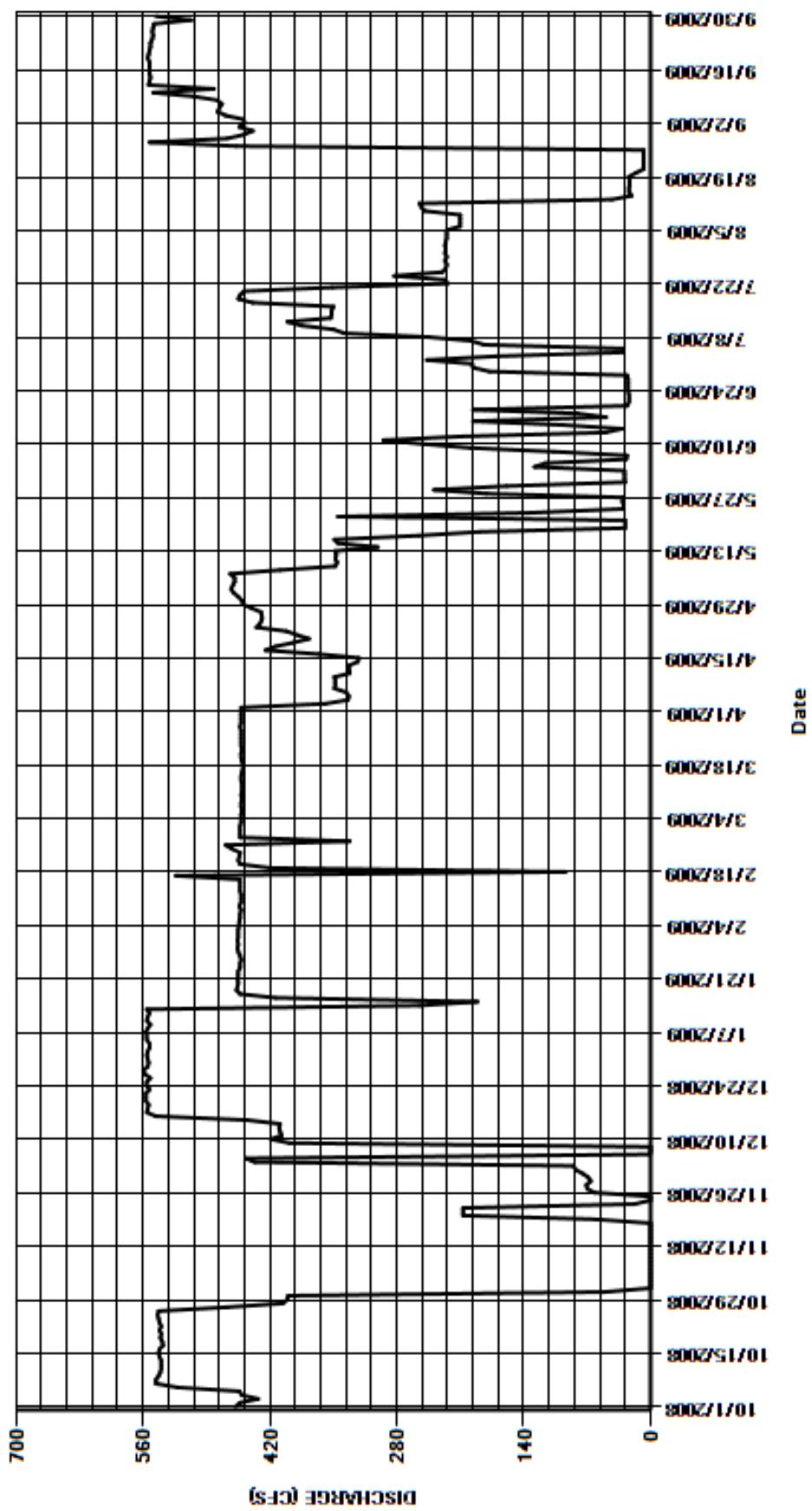
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	458	0	75	556	455	453	452	455	29	197	227	454
2	453	0	83	555	455	453	452	460	29	247	226	448
3	433	0	85	553	455	452	359	463	29	170	225	449
4	451	0	437	553	454	452	334	461	128	30	225	469
5	454	0	447	556	454	452	333	459	116	30	225	478
6	522	0	0.64	556	453	451	336	459	27	184	210	476
7	546	0	0	557	453	452	349	464	26	198	210	473
8	546	0	0	555	452	452	348	409	107	245	210	478
9	543	0	399	552	454	451	348	348	199	338	210	504
10	541	0	419	556	452	452	349	346	251	350	249	549
11	540	0	407	555	452	451	332	348	295	385	253	482
12	540	0	409	553	452	451	333	347	208	401	255	554
13	540	0	410	556	453	451	333	348	50	353	43	553
14	542	0	409	255	453	452	323	301	32	352	21	552
15	543	0	445	191	453	452	322	345	97	352	24	553
16	542	0	546	414	453	451	366	349	196	350	24	553
17	538	0	556	453	524	450	425	256	49	439	23	553
18	539	0	555	457	94	450	414	189	81	455	23	553
19	541	60	554	456	420	451	394	28	196	453	24	555
20	540	207	557	455	453	452	377	28	26	449	16	554
21	542	207	557	456	455	452	390	28	24	351	7.7	553
22	540	207	557	455	454	451	402	345	24	224	7.7	552
23	542	18	553	455	453	452	435	133	24	227	7.7	552
24	543	0	556	453	462	452	431	30	25	283	7.7	550
25	544	0	556	453	469	452	429	30	25	230	7.7	549
26	543	62	552	452	332	452	429	31	25	226	7.7	550
27	467	70	558	453	453	452	430	30	25	225	457	549
28	406	71	560	455	453	453	440	181	26	227	553	548
29	401	66	555	456	---	452	450	239	178	225	467	507
30	400	69	554	455	---	452	451	159	196	227	449	546
31	50	---	555	456	---	452	---	28	---	226	439	---
TOTAL	15330	1037.00	12906.64	14893	12275	14003	11566	8097	2743	8649	5334.2	15696
MEAN	495	34.6	416	480	438	452	386	261	91.4	279	172	523
AC-FT	30410	2060	25600	29540	24350	27770	22940	16060	5440	17160	10580	31130
MAX	546	207	560	557	524	453	452	464	295	455	553	555
MIN	50	0	0	191	94	450	322	28	24	30	7.7	448
CAL YR	2008	TOTAL	144251.64	MEAN	394	MAX	566	MIN	0	AC-FT	286100	
WTR YR	2009	TOTAL	122529.84	MEAN	336	MAX	560	MIN	0	AC-FT	243000	

MAX DISCH: 570 CFS AT 11:30 ON Dec. 21,2008 GH 4.18 FT. SHIFT 0 FT.

MAX GH: 4.18 FT. AT 11:30 ON Dec. 21,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ADAMS TUNNEL AT EAST PORTAL - COMPUTED FLOW
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

09010000 GRAND RIVER DITCH AT LA POUDRE PASS @ 10 FT PARSHALL FLUME

Water Year 2009

Location.-- Lat 40°28'22", long 105°49'17", in NW $\frac{1}{4}$ sec. 21, T.6 N., R.75 W., in Platte River Basin, to La Poudre Pass Creek, tributary to Cache La Poudre River.

Drainage and Period of Record.-- N/A.

Equipment.-- Graphic water stage recorder (weekly), Satlink II DCP and Shaft Encoder in a wooden shelter at a 10 foot Parshall flume. A drop tape is the primary reference. There is a staff in the stilling well but it is not accurate.

Hydrographic Conditions.-- The snow-pack in this area was better than the last 2 years.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with chart backup. The record is complete and reliable, except for the following days: October 17, 2008, when the stage discharge relationship was possibly affected by ice; May 2 – 12, 2009, when there was no gage height record. Recorders were installed on May 12 and the flume began flowing free from ice effect on May 13th.

Datum Corrections.-- Levels were run across the crest of the flume this year. No adjustments were necessary.

Rating.-- The control is a 10-foot concrete Parshall flume. A standard 10 ft Parshall flume rating was used. No conditions have been documented which adversely affect flume operation. One measurement, No. 63, was made this year with a discharge of 153 cfs. The peak flow of 274 cfs occurred at 1630 on June 26, 2009 at a gage height of 3.36 ft with a zero shift.

Discharge.-- Shifts have historically been zeroed out, although the trend has been for a slight negative shift. This year's measurement required a 3% adjustment to zero. Discharge was computed by direct application of the rating to the gage height record.

Special Computations.-- Discharge for the ice days was estimated by the water commissioner. The deputy commissioner changes the weekly chart and is in regular communication with the ditch operators who live in the area during the diversion season.

Remarks.-- The record is good ,except for the ice affected days and period of no gage height record, which are estimated and poor. This is a seasonal diversion and does not operate in the winter. Record developed by Lee Cunning.

Recommendations.-- Measurements are currently made by the deputy water commissioner. A measurement run should also be made once a summer by a full time hydrographer. The RP should be checked against the average crest elevation to verify the tape length. A measurement bridge in front of the gage house is needed. Additional reference marks are needed independent of the flume structure and flume crest. The chart recorder float is hanging up on something as it rises above GH= 2.9 ft. The obstruction should be removed or the recorder repositioned .

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09010000 GRAND RIVER DITCH AT LA POUDRE PASS @ 10 FT PARSHALL FLUME

RATING TABLE-- STD10FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	0	0	0	0	0	0	0	142	211	45	0.7
2	2.8	0	0	0	0	0	0	1	141	219	42	0.66
3	2.8	0	0	0	0	0	0	2	185	225	40	0.69
4	2.5	0	0	0	0	0	0	2	212	220	38	0.69
5	2.6	0	0	0	0	0	0	3	225	213	36	0.66
6	2.4	0	0	0	0	0	0	3	223	190	32	0.69
7	2.2	0	0	0	0	0	0	6	200	168	35	0.7
8	1.9	0	0	0	0	0	0	6	148	156	32	0.62
9	1.6	0	0	0	0	0	0	6	111	153	30	0.61
10	1.5	0	0	0	0	0	0	6	106	143	27	4.5
11	1.5	0	0	0	0	0	0	12	108	140	25	4.7
12	1.6	0	0	0	0	0	0	12	94	140	23	4.3
13	1.3	0	0	0	0	0	0	14	86	129	22	4.5
14	1.5	0	0	0	0	0	0	11	77	133	23	4.9
15	1.4	0	0	0	0	0	0	13	56	121	20	5.2
16	1.4	0	0	0	0	0	0	19	51	110	1.5	4.4
17	2.5	0	0	0	0	0	0	26	54	100	1.4	4.1
18	1.4	0	0	0	0	0	0	37	60	93	1.3	3.7
19	1.2	0	0	0	0	0	0	58	64	88	1.2	3.6
20	1.2	0	0	0	0	0	0	65	78	86	1.1	3.8
21	0.73	0	0	0	0	0	0	68	89	81	1.1	4
22	0.73	0	0	0	0	0	0	69	82	77	0.95	4.2
23	1.2	0	0	0	0	0	0	76	77	71	0.95	3.9
24	0.79	0	0	0	0	0	0	109	78	66	0.99	3.9
25	0.82	0	0	0	0	0	0	133	124	63	1	4.1
26	0.69	0	0	0	0	0	0	111	227	61	1.1	4.4
27	0.73	0	0	0	0	0	0	91	238	58	0.96	4.4
28	0.35	0	0	0	0	0	0	96	214	54	0.8	4.2
29	0	0	0	0	---	0	0	123	198	51	0.8	3.9
30	0	0	0	0	---	0	0	150	201	51	0.81	4.5
31	0	---	0	0	---	0	---	154	---	45	0.81	---
TOTAL	44.24	0.00	0.00	0.00	0.00	0.00	0.00	1482.00	3949	3716	486.77	95.22
MEAN	1.43	0	0	0	0	0	0	47.8	132	120	15.7	3.17
AC-FT	88	0	0	0	0	0	0	2940	7830	7370	966	189
MAX	2.9	0	0	0	0	0	0	154	238	225	45	5.2
MIN	0	0	0	0	0	0	0	0	51	45	0.8	0.61

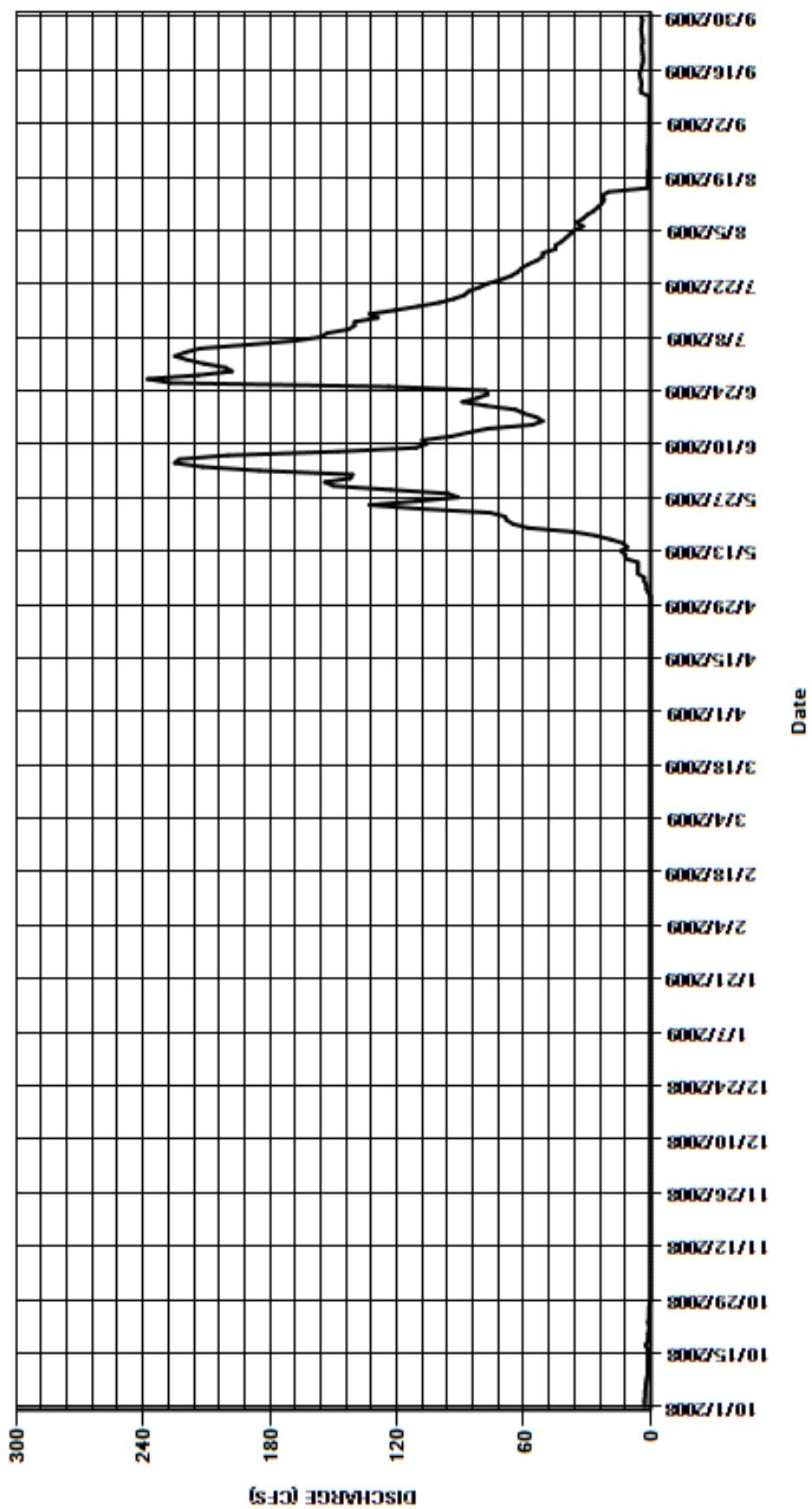
CAL YR	2008	TOTAL	10876.14	MEAN	29.7	MAX	254	MIN	0	AC-FT	21570
WTR YR	2009	TOTAL	9773.23	MEAN	26.8	MAX	238	MIN	0	AC-FT	19390

MAX DISCH: 274 CFS AT 16:30 ON Jun. 26,2009 GH 3.36 FT. SHIFT 0 FT.

MAX GH: 3.36 FT. AT 16:30 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09010000 GRAND RIVER DITCH AT LAPOUDRE PASS @ 10 FT MARSHALL FLUME
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
CAMERON PASS DITCH NEAR CAMERON PASS
Water Year 2009

Location.-- Lat 40°31'14", long 105°53'32"; Diverts water from Michigan River and tributaries, to Joe Wright Creek (tributary to Cache La Poudre River) in sec. 2, T.6 N., R.76 W.

Drainage and Period of Record.-- N/A.

Equipment.-- Stage Discharge Recorder (SDR) (installed and used exclusively during the 2009 Water Year at a 2 foot Parshall flume with staff gage inside the stilling well in a wooden shelter.

Hydrographic Conditions.-- About average snow-pack this year produced flows that were close to normal. What is diverted here is related to how soon the ditch is started. This ditch was started on June 2nd and diverted 187 acre-feet. Last year this ditch was started on June 13th, and 195 acre-feet were diverted.

Gage-Height Record.-- Primary record is hourly averages of 5-minute values collected with by the SDR. The raw SDR values were downloaded weekly by the District 3 deputy water commissioner Mark Simpson and checked by Lee Cunning. The record is complete and reliable.

Datum Corrections.-- Levels were run August 20, 2009. Staff was found to be reading 0.02 low, therefore a +0.02 datum correction was applied to the period of record for WY2009: June 2 to July 14 2009. Mean gage height for measurement No 15 made during this period was also adjusted.

Rating.-- A standard 2 ft. Parshall rating is used. The rating has been verified to 5.76 cfs. One measurement (No. 15) was made this year. The peak flow of 7.03 cfs occurred at 2020 on June 25, 2009 at a gage height of 0.92 ft (datum correction of +0.02 ft applied) with a shift of 0.00 ft.

Discharge.-- A shift of 0.00 was used for the entire season, based on Msmt No. 15 made on June 23, 2009. The width at the top of the flume walls is 3.2 feet. It can be noted that the walls are starting to collapse.

Special Computations.-- None.

Remarks.-- Record is good. Water was run from June 2nd until July 14th, 2009. Record developed by Lee Cunning.

Recommendations.-- Make two measurements at higher and lower ranges. Re-install current staff inside well so it can be read correctly.

STATE OF COLORADO
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OFFICE OF STATE ENGINEER

CAMERON PASS DITCH NEAR CAMERON PASS

RATING TABLE--

STD02FTP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	2.4	0	0
2	0	0	0	0	0	0	0	0	0.27	2.3	0	0
3	0	0	0	0	0	0	0	0	1.2	2.3	0	0
4	0	0	0	0	0	0	0	0	1.7	2.1	0	0
5	0	0	0	0	0	0	0	0	2.6	1.9	0	0
6	0	0	0	0	0	0	0	0	3.2	1.5	0	0
7	0	0	0	0	0	0	0	0	2.7	1.2	0	0
8	0	0	0	0	0	0	0	0	2.2	0.85	0	0
9	0	0	0	0	0	0	0	0	1.8	0.66	0	0
10	0	0	0	0	0	0	0	0	1.5	0.56	0	0
11	0	0	0	0	0	0	0	0	1.4	0.53	0	0
12	0	0	0	0	0	0	0	0	1.2	0.51	0	0
13	0	0	0	0	0	0	0	0	1.3	0.47	0	0
14	0	0	0	0	0	0	0	0	1.6	0.24	0	0
15	0	0	0	0	0	0	0	0	1.9	0	0	0
16	0	0	0	0	0	0	0	0	2	0	0	0
17	0	0	0	0	0	0	0	0	2.3	0	0	0
18	0	0	0	0	0	0	0	0	2.7	0	0	0
19	0	0	0	0	0	0	0	0	3	0	0	0
20	0	0	0	0	0	0	0	0	3.2	0	0	0
21	0	0	0	0	0	0	0	0	3.7	0	0	0
22	0	0	0	0	0	0	0	0	4.6	0	0	0
23	0	0	0	0	0	0	0	0	4.8	0	0	0
24	0	0	0	0	0	0	0	0	5	0	0	0
25	0	0	0	0	0	0	0	0	5.8	0	0	0
26	0	0	0	0	0	0	0	0	6	0	0	0
27	0	0	0	0	0	0	0	0	5	0	0	0
28	0	0	0	0	0	0	0	0	4.2	0	0	0
29	0	0	0	0	---	0	0	0	3.4	0	0	0
30	0	0	0	0	---	0	0	0	2.8	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.07	17.52	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	2.77	0.57	0	0
AC-FT	0	0	0	0	0	0	0	0	165	35	0	0
MAX	0	0	0	0	0	0	0	0	6	2.4	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

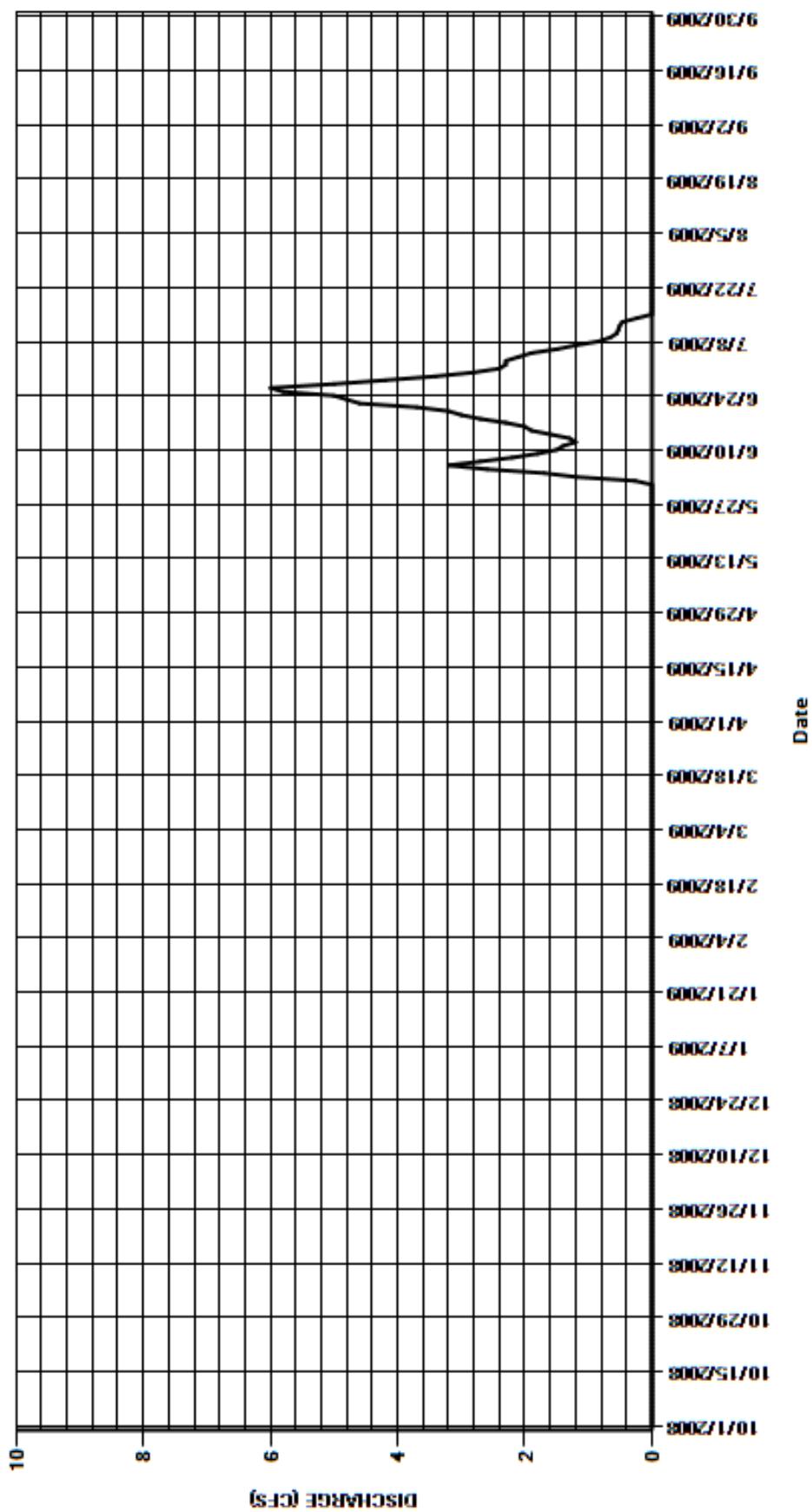
CAL YR	2008	TOTAL	98.39	MEAN	0.27	MAX	6.2	MIN	0	AC-FT	195
WTR YR	2009	TOTAL	100.59	MEAN	0.28	MAX	6	MIN	0	AC-FT	200

MAX DISCH: 7.03 CFS AT 20:20 ON Jun. 25,2009 GH 0.92 FT. SHIFT 0 FT. (DATUM CORR. OF +0.02 FT APPLIED)

MAX GH: 0.92 FT. AT 20:20 ON Jun. 25,2009 (DATUM CORR. OF +0.02 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CAMERON PASS DITCH NEAR CAMERON PASS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06746000 MICHIGAN DITCH AT CAMERON PASS
Water Year 2009

Location.--	Lat. 40°31'14", Long. 105°53'30"; Diverts water from Michigan River and tributaries, to Joe Wright Creek (tributary to Cache la Poudre River) in sec. 2, T.6 N., R. 76 W.
Drainage and Period of Record.--	N/A.
Equipment.--	Satellite monitoring equipment and weekly graphic water-stage recorder in a log shelter with a PVC well at 8 foot Parshall flume. An inside electric tape to the stilling well serves as the primary reference gage. The structure also has a 0.75-foot or 9-inch Parshall that sits side by side with the 8-foot flume. This allows winter and low flows (flows below about 4.5 cfs) to be measured. Two rating tables are used. The crest height for both flumes is tied to the electric tape, as both flumes share a common stilling well. The shelter is heated by propane so that the flume and well are free of ice. City of Fort Collins personnel put sections of halved 2 foot culverts in the ditch below the flume to stop the back water conditions we have experienced in the past.
Hydrographic Conditions.--	Last water year 6,740 acre-feet were diverted and 2002 produced less than 1,500 acre-feet. 5,950 acre-feet were diverted this water year.
Gage-Height Record.--	Primary record is hourly averages of 15 minute data taken from satellite monitoring, with chart backup. Encoder calibration was supported by weekly visits. The record is complete and reliable. October 1, 2008 - May 19, 2009 satellite values from 9 inch Parshall. May 19, 2009 the flumes were switched from 9 inch Parshall to 8 foot Parshall. September 10, 2009 the flumes were switched from the 8 foot Parshall to the 9 inch Parshall.
Datum Corrections.--	Levels have not been run officially. The inside electric tape to the stilling well was installed June 24, 2003, "per levels", but no DWR or City of Fort Collins documentation exists.
Rating.--	The control is an 8-foot Parshall flume with a standard rating that is defined for the range of flow experienced. The winter flow control is a standard 9 inch Parshall table. At this point there are no sources of shift other than movement of the flume crests and this has not been observed. Two measurements (Nos. 36 and 37) were made this water year. Measurement 36 was made in the 9" Parshall Flume with a zero shift. Measurement 37 was made in the 8 ft Parshall Flume with a zero shift. The peak flow of 72.2 cfs occurred at 2045 on June 25, 2009 at a gage height of 1.66 feet using a zero shift (flow was through the 8 ft. Parshall Flume).
Discharge.--	For the period of record, shifting control method was used. A zero shift was applied all year.
Special Computations.--	The maximum GH for the water year (1.70 ft at 20:00 May 12, 2009) was recorded during the period when the 9 in. flume was in use. The records spreadsheet calculated the peak discharge incorrectly using this maximum GH. The correct peak discharge, from the 8 ft. flume with a lower GH, had to be hand calculated and edited into the yearly summary page.
Remarks.--	The record is considered good. Record developed by Lee Cunning.
Recommendations.--	Transition from the 8 ft to the 9 in. flume in the fall should be observed and a pygmy meter measurement should be made on the 8 ft. flume just prior to the switch. The height of the boards placed in front of the 8 ft. flume should be documented. Levels need to be run and another independent Reference Mark (R.M.) should be established. If flows above a GH of 2.0 ft are possible in the 9 in. flume, the rating will need to be verified.

STATE OF COLORADO
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06746000 MICHIGAN DITCH AT CAMERON PASS

RATING TABLE--

STD09INPF USED FROM 01-Oct-2008 TO 19-May-2009
STD08FTPFPFEXP USED FROM 19-May-2009 TO 10-Sep-2009
STD09INPF USED FROM 10-Sep-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.2	2	0.74	0.46	0.62	0.4	0.27	2	35	49	11	4.3
2	4.1	2	0.7	0.49	0.6	0.42	0.26	2.1	37	49	10	4.3
3	4	2	0.7	0.63	0.59	0.47	0.26	2.1	39	50	9.9	4.3
4	3.9	1.7	0.68	0.64	0.6	0.49	0.26	2.5	44	50	9.4	4.1
5	3.9	1	0.66	0.64	0.6	0.49	0.24	2.2	44	48	9.1	4.1
6	3.8	0.78	0.65	0.64	0.63	0.49	0.25	2.1	44	42	9	4
7	3.6	0.88	0.82	0.64	0.64	0.49	0.28	3.1	39	38	8.7	3.9
8	3.4	1.7	0.94	0.64	0.63	0.49	0.34	3.5	32	34	8.3	3.9
9	3.3	1.8	0.91	0.64	0.62	0.49	0.36	2.8	28	32	8	3.8
10	3.1	1.7	0.96	0.64	0.54	0.49	0.33	2.8	26	31	7.7	3.4
11	3	1.6	1	0.64	0.47	0.47	0.3	3.5	26	30	7.3	3.1
12	3.1	1.4	0.98	0.64	0.45	0.45	0.32	5.2	25	30	7.1	3.1
13	2.9	1.6	0.84	0.64	0.44	0.44	0.32	5.6	27	28	6.9	3.2
14	2.9	1.2	0.71	0.64	0.42	0.44	0.33	2.4	30	27	7.2	3.4
15	2.8	1.5	0.64	0.64	0.41	0.45	0.35	0.36	32	25	7.2	3.6
16	2.7	1.5	0.64	0.65	0.4	0.49	0.36	0.41	31	23	6.8	3.4
17	2.6	1.5	0.64	0.66	0.4	0.51	0.38	0.45	35	22	6.5	3.3
18	2.6	1.5	0.63	0.67	0.39	0.5	0.35	0.56	42	20	6.1	3.2
19	2.5	1.5	0.61	0.67	0.38	0.51	0.35	11	46	19	5.9	3.1
20	2.4	1.4	0.58	0.67	0.37	0.52	0.34	22	48	19	5.8	3.3
21	1.7	1.3	0.55	0.68	0.38	0.52	0.36	19	51	18	5.6	3.5
22	1.6	1.3	0.54	0.7	0.37	0.55	0.47	16	56	17	5.3	3.6
23	2.4	1.2	0.51	0.69	0.4	0.62	0.75	20	58	16	5.4	3.5
24	2.4	1.2	0.51	0.67	0.47	0.42	0.42	26	59	15	5.4	3.5
25	2.4	1.2	0.51	0.63	0.53	0.35	0.42	30	62	14	5.4	3.6
26	2.3	1.1	0.5	0.66	0.52	0.32	0.38	30	55	14	5.3	3.8
27	2.2	1.1	0.49	0.64	0.46	0.3	0.29	28	40	14	5.2	3.7
28	2.2	1.1	0.49	0.62	0.4	0.29	0.31	27	49	13	4.9	3.5
29	2.1	1	0.47	0.62	---	0.29	0.84	30	57	13	4.8	3.3
30	2.1	0.83	0.46	0.62	---	0.29	3.4	34	52	13	4.8	3.5
31	2	---	0.47	0.62	---	0.28	---	36	---	12	4.7	---
TOTAL	88.2	41.59	20.53	19.73	13.73	13.73	13.89	372.68	1249	825	214.7	108.3
MEAN	2.85	1.39	0.66	0.64	0.49	0.44	0.46	12	41.6	26.6	6.93	3.61
AC-FT	175	82	41	39	27	27	28	739	2480	1640	426	215
MAX	4.2	2	1	0.7	0.64	0.62	3.4	36	62	50	11	4.3
MIN	1.6	0.78	0.46	0.46	0.37	0.28	0.24	0.36	25	12	4.7	3.1

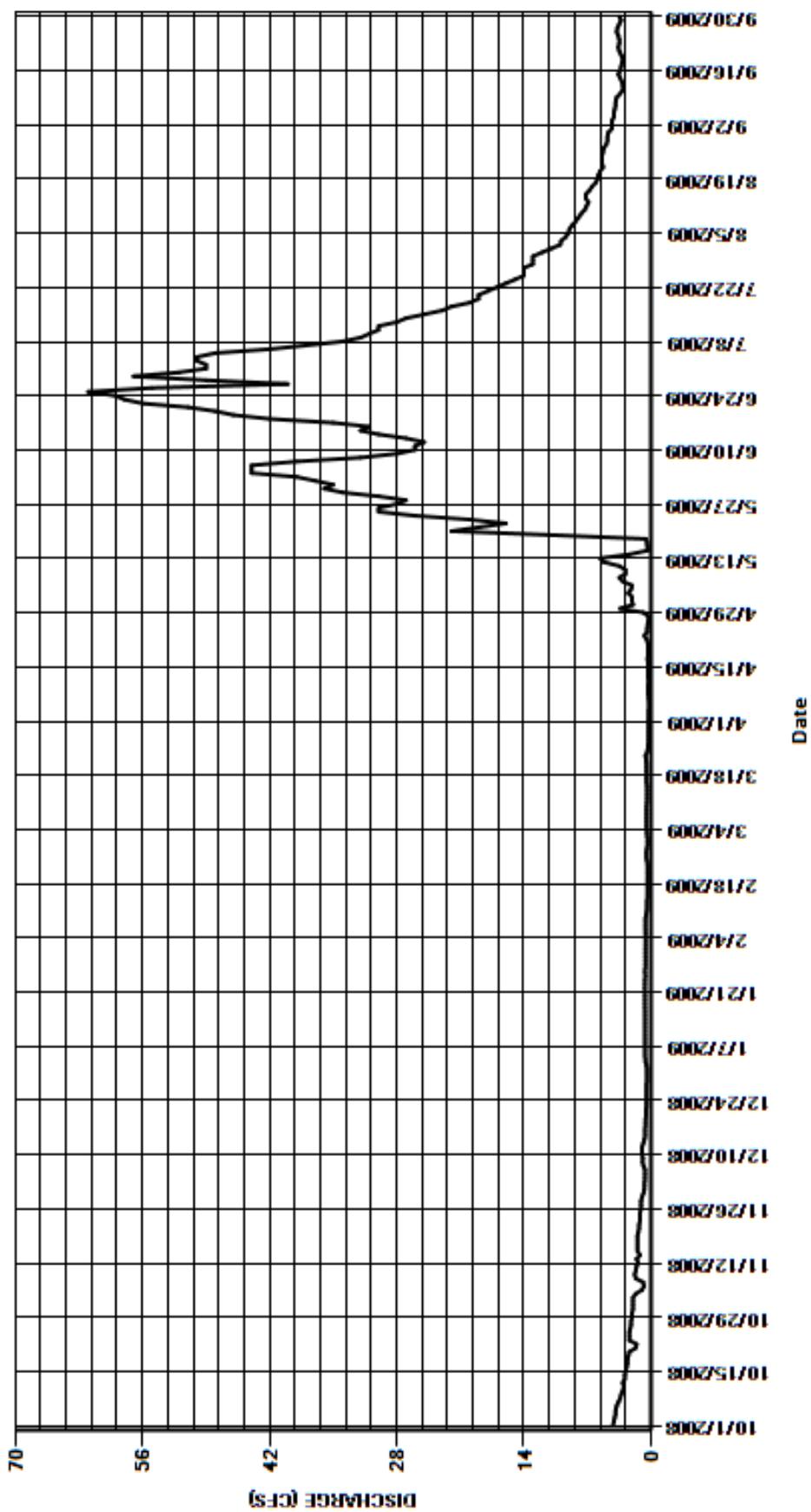
CAL YR	2008	TOTAL	3265.76	MEAN	8.92	MAX	74	MIN	0.32	AC-FT	6480
WTR YR	2009	TOTAL	2981.08	MEAN	8.17	MAX	62	MIN	0.24	AC-FT	5910

MAX DISCH: 72.2 CFS AT 20:00 ON Jun. 25,2009 GH 1.66 FT. SHIFT 0 FT.

MAX GH: 1.7 FT. AT 20:00 ON May. 12,2009 (RECORDED DURING PERIOD WHEN 9-IN PF WAS IN USE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06746000 MICHIGAN DITCH AT CAMERON PASS
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06746500 SKYLINE DITCH AT CHAMBERS LAKE
Water Year 2009

Location.-- Lat 40°39'50", long 105°53'10" Diverts water from West Branch Laramie River to Chambers Lake (tributary to Cache la Poudre River) in sec. 31, T.8 N., R.75 W.

Drainage and Period of Record.-- N/A.

Equipment.-- F-type (weekly) graphic water-stage recorder in a wooden shelter at a 10-foot Parshall flume. A drop tape inside the well determines the gage height.

Hydrographic Conditions.--

Gage-Height Record.-- The primary record is mean daily gage heights taken from the chart recorder. This is the only source. The charts are worked by the District 3 water commissioner and checked by hydrographer. No water was diverted this year.

Datum Corrections.-- The drop tape and RP are tied to the average crest elevation of the flume. Levels were run on June 6, 2000 and verified the correct tape length of 8.15 feet.

Rating.-- A standard Parshall flume rating, STD10FTPF, is used.

Discharge.-- Shifts have been zero or adjusted to zero in the past.

Special Computations.--

Remarks.-- Record is good. No water was diverted this year. Record developed by Lee Cunning.

Recommendations.-- Levels should be run to check the R.P. well and flume staffs .

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06746500 SKYLINE DITCH AT CHAMBERS LAKE

RATING TABLE--

STD10FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	0	0	0	0
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	0	0	0	0	0	0	0	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

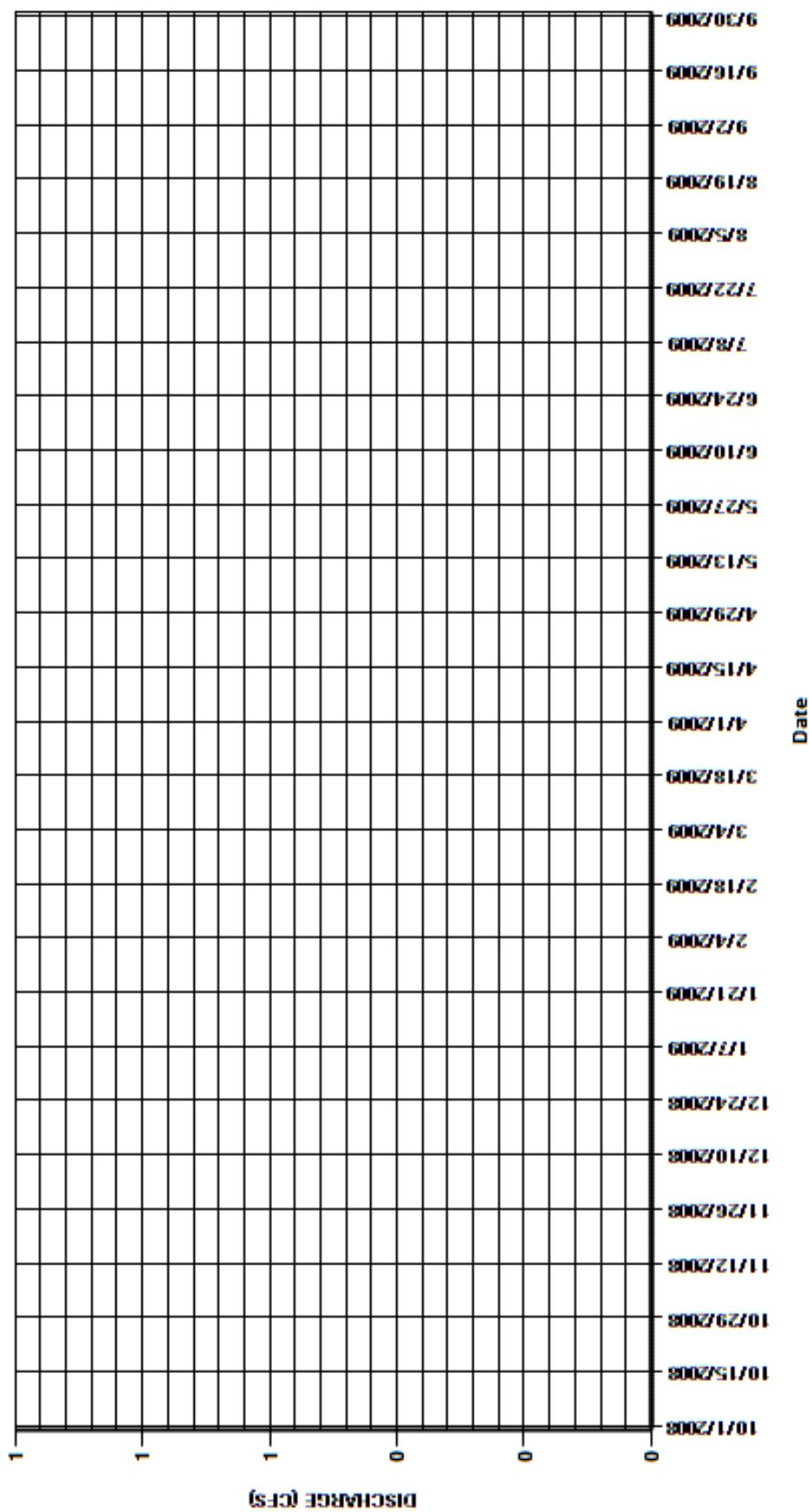
CAL YR	2008	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0
WTR YR	2009	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0

MAX DISCH:

MAX GH: FT.

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06746500 SKYLINE DITCH AT CHAMBERS LAKE
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
06747000 LARAMIE POUDRE TUNNEL @ 10 FT PARSHALL FLUME
Water Year 2009

Location.-- Lat. 40°40'34", Long. 105°50'49"; Laramie-Poudre tunnel diverts water from Laramie River and tributaries to Cache la Poudre River in sec 9, T.8 N., R.75 W.

Drainage and Period of Record.-- N/A.

Equipment.-- F-type graphic water stage recorder with satellite telemetry at a 10 foot Parshall flume. The gage is referenced with a drop tape from an IG reference point. There is also an outside staff gage.

Hydrographic Conditions.-- The tunnel was started on May 14th and water was diverted until October 13th, 2009. The tunnel produced 14,050 acre-feet of the 19,875-foot "quota". This year the tunnel was turned 'off' on June 2nd through the 30th, 2009 due to a free river on the Cache La Poudre River. There was a small amount of flow (around 2-3 cfs) that leaked through the diversion gates.

Gage-Height Record.-- Primary record is hourly averages of 15-minute data taken from satellite monitoring with chart back up. The record is complete and reliable. The DCP was turned on May 14th as the tunnel started diverting flow. The DCP ran well all summer with only a few missing hourly values.

Datum Corrections.-- Leveks were run across the throat of the flume were run this year. No corrections were necessary. A secondary Reference Mark (R.M.) was installed on the top of the left downstream wingwall at elevation = 3.386 ft.

Rating.-- The rating is a standard 10-ft Parshall flume rating, LAPTUNCO02. It was used for the entire water year. One measurement (No. 51) was made this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 10 ft Parshall Flume is 6 to 200 cfs. Anything above or below this range is outside the +/- 5% accuracy range unless defined by measurements. Given this fact, flows below 6 cfs, which occurred June 3 - 29, 2009 are considered fair. Peak flow of 271 cfs occurred at 2345 on July 27 at a gage height of 3.34 ft with a zero shift.

Discharge.-- Measurement No. 51 showed a shift of +0.06 ft, but was adjusted by +5% to a zero shift. Discharge was computed by direct application of the rating to the gage height record.

Special Computations.-- None.

Remarks.-- Record is good. Record developed by Lee Cunning.

Recommendations.--

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06747000 LARAMIE POUDRE TUNNEL @ 10 FT PARSHALL FLUME

RATING TABLE--

STD10FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

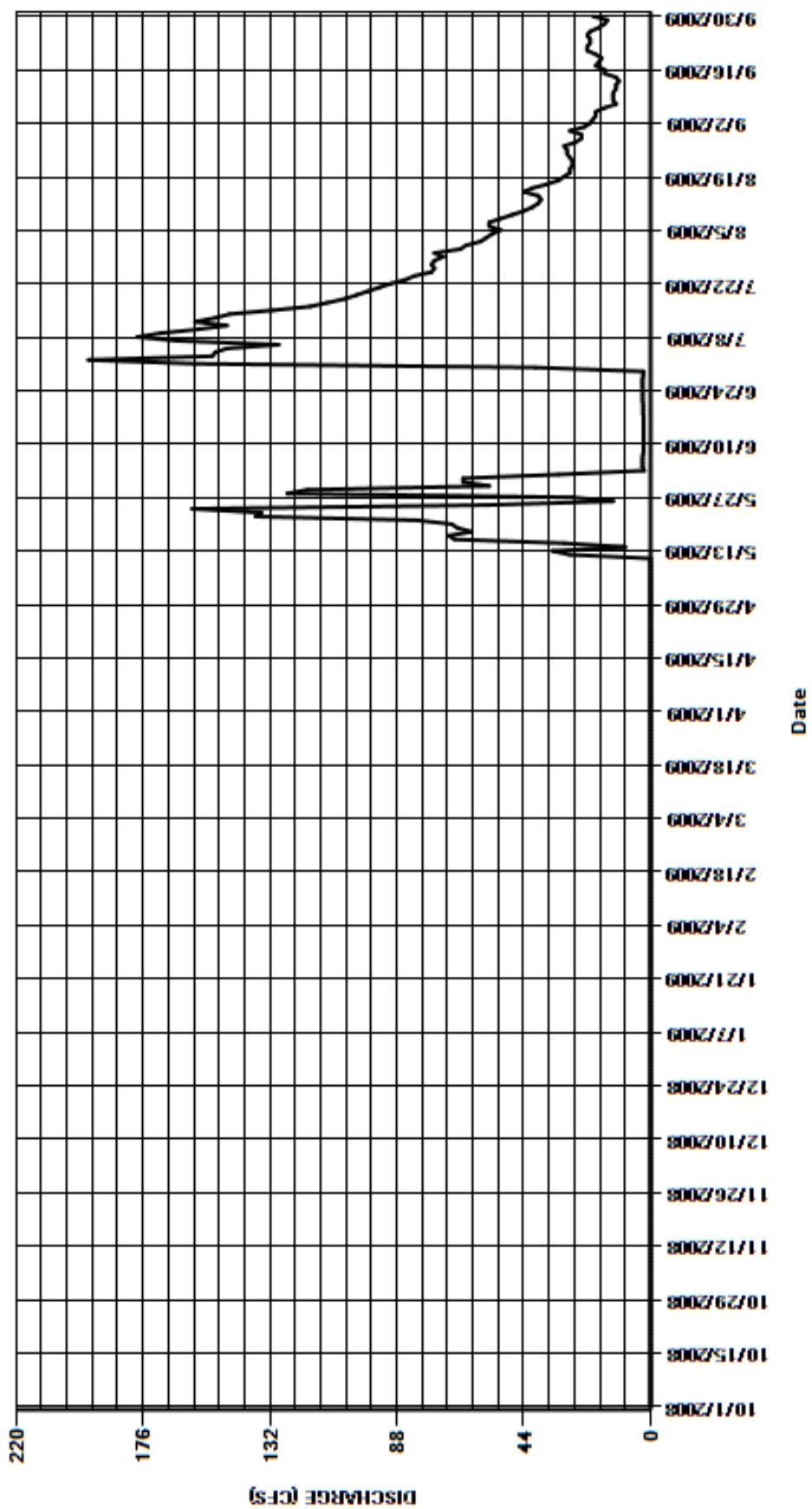
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	65	158	64	23
2	0	0	0	0	0	0	0	0	32	195	59	21
3	0	0	0	0	0	0	0	0	2.3	152	57	20
4	0	0	0	0	0	0	0	0	2.8	151	55	19
5	0	0	0	0	0	0	0	0	2.8	147	52	19
6	0	0	0	0	0	0	0	0	2.8	129	56	16
7	0	0	0	0	0	0	0	0	2.7	164	56	12
8	0	0	0	0	0	0	0	0	2.5	178	52	13
9	0	0	0	0	0	0	0	0	2.5	170	48	13
10	0	0	0	0	0	0	0	0	2.5	157	44	13
11	0	0	0	0	0	0	0	0	2.5	147	41	12
12	0	0	0	0	0	0	0	28	2.5	158	39	12
13	0	0	0	0	0	0	0	34	2.5	151	38	11
14	0	0	0	0	0	0	0	8.8	2.5	146	39	12
15	0	0	0	0	0	0	0	30	2.5	131	44	16
16	0	0	0	0	0	0	0	68	2.5	118	41	16
17	0	0	0	0	0	0	0	70	2.5	112	36	19
18	0	0	0	0	0	0	0	62	2.6	106	32	18
19	0	0	0	0	0	0	0	67	2.6	102	30	17
20	0	0	0	0	0	0	0	69	2.6	98	28	19
21	0	0	0	0	0	0	0	81	2.7	94	28	22
22	0	0	0	0	0	0	0	137	2.7	90	27	22
23	0	0	0	0	0	0	0	135	2.7	85	27	21
24	0	0	0	0	0	0	0	159	2.7	82	28	21
25	0	0	0	0	0	0	0	57	2.8	76	29	22
26	0	0	0	0	0	0	0	13	2.9	75	29	21
27	0	0	0	0	0	0	0	27	2.8	76	30	18
28	0	0	0	0	0	0	0	126	2.6	75	26	16
29	0	0	0	0	---	0	0	119	2.5	72	24	15
30	0	0	0	0	---	0	0	56	40	75	24	20
31	0	---	0	0	---	0	---	65	---	66	28	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1411.80	207.6	3736	1211	519
MEAN	0	0	0	0	0	0	0	45.5	6.92	121	39.1	17.3
AC-FT	0	0	0	0	0	0	0	2800	412	7410	2400	1030
MAX	0	0	0	0	0	0	0	159	65	195	64	23
MIN	0	0	0	0	0	0	0	0	2.3	66	24	11
CAL YR	2008	TOTAL	9149.20	MEAN	25.1	MAX	262	MIN	0	AC-FT	18150	
WTR YR	2009	TOTAL	7085.40	MEAN	19.4	MAX	195	MIN	0	AC-FT	14050	

MAX DISCH: 271 CFS AT 23:45 ON Jul. 01,2009 GH 3.34 FT. SHIFT 0 FT.

MAX GH: 3.34 FT. AT 23:45 ON Jul. 01,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06747000 LARAMIE POUDRE TUNNEL @ 10 FT PARSHALL FLUME
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY
Water Year 2009

Location.-- Lat 40°31'50", long 105°45'40" Sec. 11, T9N, R75W.

Drainage and Period of Record.-- N/A.

Equipment.-- Stevens F-type graphic water-stage recorder and Stage Discharge Recorder (SDR) in a metal shelter with stilling well at a 3-foot Parshall flume owned by the City of Greeley. There is a staff in the flume and a drop tape for the well, with the drop tape being the primary reference.

Hydrographic Conditions.-- The snow pack in this area was slightly above normal this year. Due to cooler temperatures, above average snowpack and copious amounts of rainfall throughout the Spring runoff, the ditch was shut off earlier. The Poudre River was on 'Free River' status for the first time in over 10 years.

Gage-Height Record.-- Primary record was taken from 5-minute SDR Data with chart gage heights as back up for the period: May 7-13. Access to this gage is very difficult. The gage was dug out and the recorder was installed on May 7, 2009. Water diverted from May 7, 2009 at 08:00 until June 14, 2009 at 12:00 PM. The record complete and reliable, except for May 12 and 13 when the chart clock stopped. The SDR was not turned on until May 13. Peak gage height was 1.14 ft at 2015 on May 25, 2009.

Datum Corrections.-- Iter was installed and levels were run on October 7, 2004 tying the average crest height to a reference point on the shelf. A drop tape was made. The staff reads approximately 0.04 lower than the drop tape. The crest of the flume is nearly level (only about 0.01 change across the crest). There is a slight 'tilt' at the staff to the inlets of about 0.15 feet. The floor of the flume at the staff is about 0.04 feet higher causing the outside staff to read about 0.04 feet less than the drop tape. Levels were run on June 8, 2009. Flume crest and Reference Point were found to be stable and reading correctly. A +0.04 ft correction was applied to period of record from May 7 to June 8, 2009 due to the fact the staff was reading 0.04 feet low. Visits during this period were set to the staff and therefore needed correction. Subsequent visits were set to the tape which is and was reading correctly.

Rating.-- Rating No. 1 is a standard 3-foot Parshall flume. Two measurements (Nos. 6 and 7) were made. The peak flow of 14.70 cfs occurred at 2015 on May 25, 2009 at a gage height of 1.14 ft (datum correction of +0.04 ft applied) with a shift of 0.00 ft.

Discharge.-- A zero shift was used for the entire season. Discharge was computed by direct application of the rating to the gage height record.

Special Computations.-- None.

Remarks.-- The record is good, except for May 12 -13 which are estimated and poor. Record developed by Lee Cunning.

Recommendations.-- None.

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DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY

RATING TABLE--

STD03FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	5.9	0	0	0
2	0	0	0	0	0	0	0	0	6.5	0	0	0
3	0	0	0	0	0	0	0	0	5.9	0	0	0
4	0	0	0	0	0	0	0	0	5.2	0	0	0
5	0	0	0	0	0	0	0	0	4.3	0	0	0
6	0	0	0	0	0	0	0	0	3.8	0	0	0
7	0	0	0	0	0	0	0	0.24	3.5	0	0	0
8	0	0	0	0	0	0	0	0.38	4.5	0	0	0
9	0	0	0	0	0	0	0	0.32	3.7	0	0	0
10	0	0	0	0	0	0	0	0.32	4.5	0	0	0
11	0	0	0	0	0	0	0	0.35	1.8	0	0	0
12	0	0	0	0	0	0	0	0.23	0.47	0	0	0
13	0	0	0	0	0	0	0	0.36	0.33	0	0	0
14	0	0	0	0	0	0	0	0.44	0.15	0	0	0
15	0	0	0	0	0	0	0	0.56	0.05	0	0	0
16	0	0	0	0	0	0	0	0.59	0.02	0	0	0
17	0	0	0	0	0	0	0	0.69	0	0	0	0
18	0	0	0	0	0	0	0	0.92	0	0	0	0
19	0	0	0	0	0	0	0	2.2	0	0	0	0
20	0	0	0	0	0	0	0	6.5	0	0	0	0
21	0	0	0	0	0	0	0	0	7	0	0	0
22	0	0	0	0	0	0	0	0	7	0	0	0
23	0	0	0	0	0	0	0	7.4	0	0	0	0
24	0	0	0	0	0	0	0	8.9	0	0	0	0
25	0	0	0	0	0	0	0	9.3	0	0	0	0
26	0	0	0	0	0	0	0	11	0	0	0	0
27	0	0	0	0	0	0	0	9.2	0	0	0	0
28	0	0	0	0	0	0	0	8.4	0	0	0	0
29	0	0	0	0	---	0	0	6.6	0	0	0	0
30	0	0	0	0	---	0	0	5.7	0	0	0	0
31	0	---	0	0	---	0	---	5.4	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	50.62	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	3.23	1.69	0	0	0
AC-FT	0	0	0	0	0	0	0	198	100	0	0	0
MAX	0	0	0	0	0	0	0	11	6.5	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

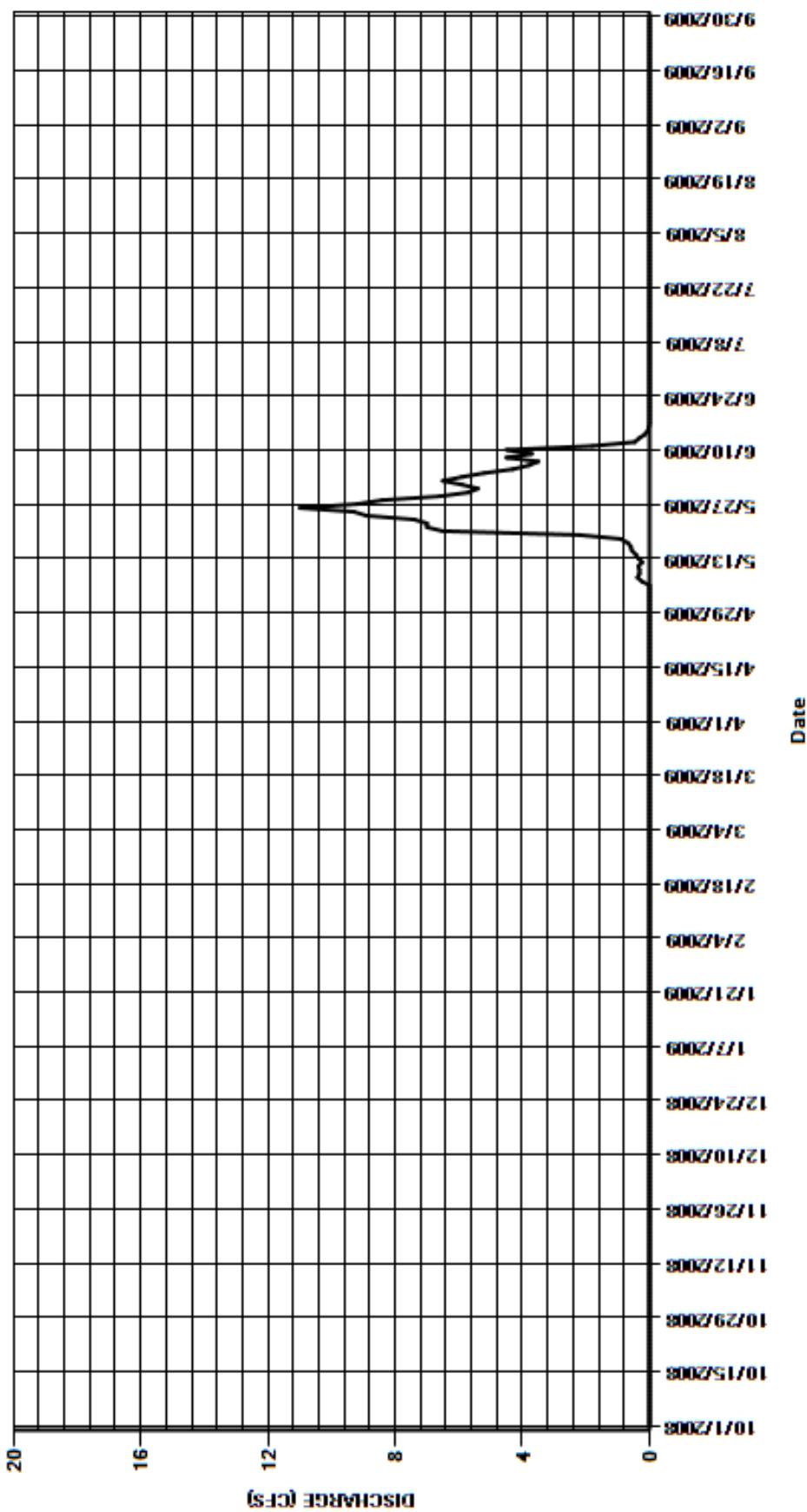
CAL YR	2008	TOTAL	155.94	MEAN	0.43	MAX	9.5	MIN	0	AC-FT	309
WTR YR	2009	TOTAL	150.62	MEAN	0.41	MAX	11	MIN	0	AC-FT	299

MAX DISCH: 14.7 CFS AT 20:15 ON May. 25,2009 GH 1.14 FT. SHIFT 0 FT. (DATUM CORR. OF +0.04 FT APPLIED)

MAX GH: 1.14 FT. AT 20:15 ON May. 25,2009 (DATUM CORR. OF +0.04 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOBCREEKDITCH NEAR DEADMAN MTN.. NEAR GLENDEVEY
WY2009 HYDROGRAPH



PLATTE RIVER BASIN
DEADMAN DITCH NEAR DEADMAN PARK
Water Year 2009

Location.-- Lat 40°50'04", long 105°48'05", sec. 9, T. 10 N., R. 75 W., Diverts water from Laramie River and tributaries, to Sheep Creek (tributary to Cache La Poudre River) via Sand Creek.

Drainage and Period of Record.-- N/A.

Equipment.-- F-type graphic water-stage recorder and a Stage Discharge Recorder (SDR) in a steel shelter at a 6 foot Parshall flume. The gage is referenced with an outside staff gage in the flume.

Hydrographic Conditions.-- Various entities decided to plow the road into this site and scoop the snow out of the ditch.

Gage-Height Record.-- The primary record is 5-minute data taken from the SDR with the chart as backup. The record is complete and reliable, except for the week starting May 5-13. During this period the F-Type Recorder clock was stopped and the SDR had not yet been installed. Flows were considered zero during this period because no reliable record was available. May 14 – 18 was slightly ice affected. A -0.02 ft gage height correction was made on July 1, 2009 and prorated back to the last visit on June 25, 2009.

Datum Corrections.-- Levels were last run across the crest of the flume on August 6, 2009. The gage was found to be reading correctly at that time. A new Reference Mark (R.M. #2) was established on the right side footer of the Downstream (D/S) wing-wall. The elevation established for this R.M. #2 was 0.862 ft.

Rating.-- A standard 6 ft. Parshall rating is used, and is defined for all ranges of flow experienced at this gage. One Measurement, No. 21, was made June 1, 2009. Peak flow of 34.3 cfs occurred at 1600 May 26, 2009 at a gage height of 1.25 ft with a shift of 0.00 ft.

Discharge.-- Measurement 21 was adjusted -2% to a zero shift. All past measurements have been zero or adjusted to zero. A zero shift was deemed applicable for conditions and used for the period of record.

Special Computations.-- None.

Remarks.-- Record is good except for May 14 – 18 which was ice affected and considered fair. The ditch was started up on April 24, 2009 but water did not run until May 13, 2009 and was shut off on August 5, 2009. Small flows were recorded in the ditch on April 26, May 2-3, 2009 prior to ditch operation. These flows were from small precipitation events and do not represent diversions. These flows were not enough to make it to the WSDEARCO gaging station. The record was developed by Lee Cunning and checked by the district 3 deputy water commissioner, Mark Simpson.

Recommendations.-- Re-check R.M. #2 with levels next water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DEADMAN DITCH NEAR DEADMAN PARK

RATING TABLE--

STD06FTP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

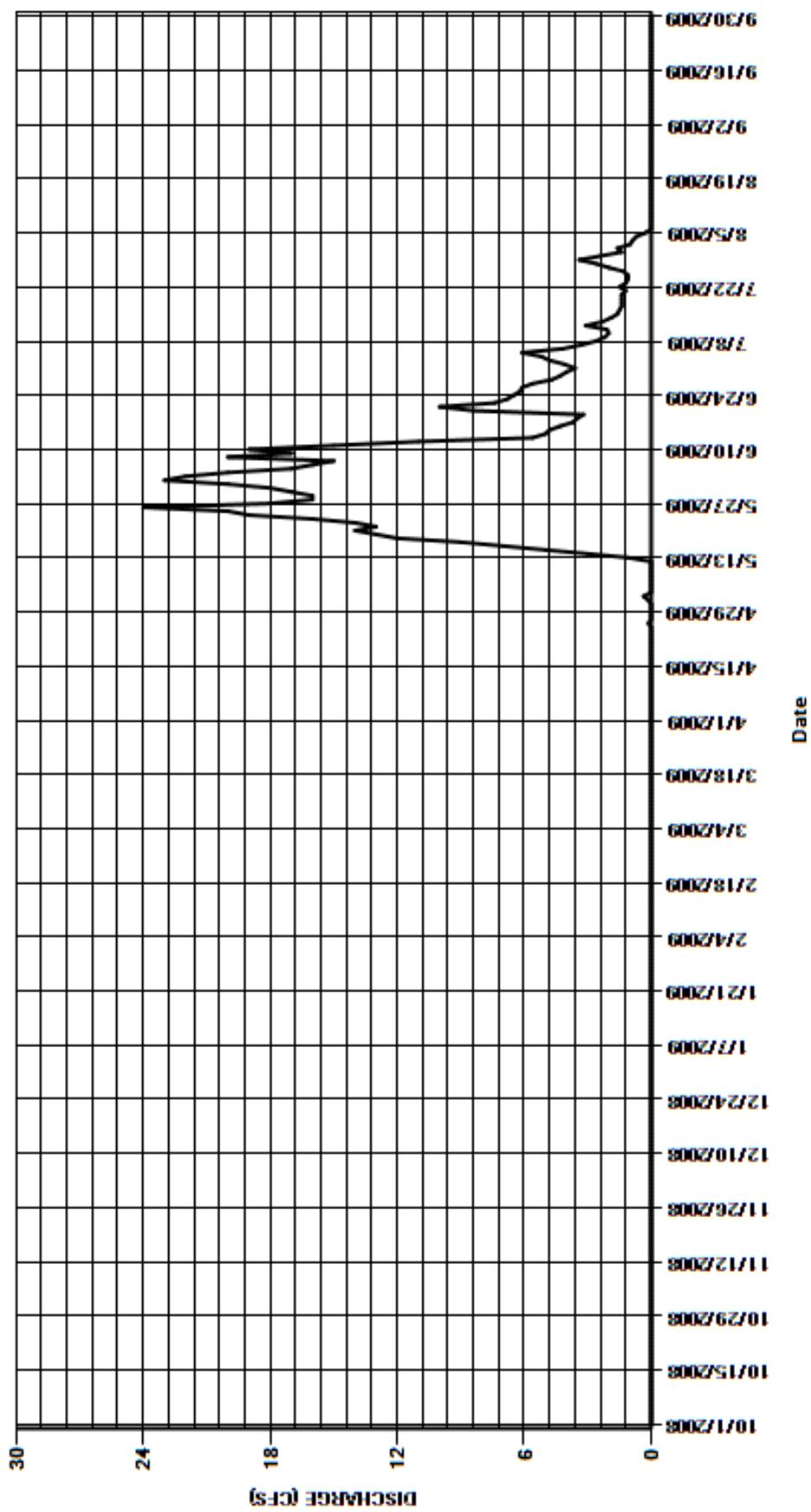
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	20	3.6	1.6	0
2	0	0	0	0	0	0	0	0.14	23	4.1	1	0
3	0	0	0	0	0	0	0	0.36	22	4.8	0.88	0
4	0	0	0	0	0	0	0	0	20	5.2	0.72	0
5	0	0	0	0	0	0	0	0	17	6.1	0.27	0
6	0	0	0	0	0	0	0	0	16	4.2	0	0
7	0	0	0	0	0	0	0	0	15	3.3	0	0
8	0	0	0	0	0	0	0	0	20	2.6	0	0
9	0	0	0	0	0	0	0	0	17	2.2	0	0
10	0	0	0	0	0	0	0	0	19	2	0	0
11	0	0	0	0	0	0	0	0	15	2.1	0	0
12	0	0	0	0	0	0	0	0	11	3.1	0	0
13	0	0	0	0	0	0	0	1.1	5.6	2.3	0	0
14	0	0	0	0	0	0	0	3	5	1.9	0	0
15	0	0	0	0	0	0	0	5	4.8	1.6	0	0
16	0	0	0	0	0	0	0	7	4.3	1.5	0	0
17	0	0	0	0	0	0	0	9	3.7	1.4	0	0
18	0	0	0	0	0	0	0	12	3.5	1.4	0	0
19	0	0	0	0	0	0	0	13	3.2	1.4	0	0
20	0	0	0	0	0	0	0	14	8.4	1.4	0	0
21	0	0	0	0	0	0	0	13	10	1.2	0	0
22	0	0	0	0	0	0	0	14	7.4	1.5	0	0
23	0	0	0	0	0	0	0	16	6.8	1.2	0	0
24	0	0	0	0	0	0	0	19	6.5	1.1	0	0
25	0	0	0	0	0	0	0	20	6.2	1.1	0	0
26	0	0	0	0	0	0	0.13	24	6.1	1.3	0	0
27	0	0	0	0	0	0	0	18	5.6	2	0	0
28	0	0	0	0	0	0	0	16	4.7	2.6	0	0
29	0	0	0	0	---	0	0	16	4.3	3.4	0	0
30	0	0	0	0	---	0	0	17	4	2.4	0	0
31	0	---	0	0	---	0	---	18	---	1.4	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.13	255.60	315.1	75.4	4.47	0.00
MEAN	0	0	0	0	0	0	0.004	8.25	10.5	2.43	0.14	0
AC-FT	0	0	0	0	0	0	0.3	507	625	150	8.9	0
MAX	0	0	0	0	0	0	0.13	24	23	6.1	1.6	0
MIN	0	0	0	0	0	0	0	0	3.2	1.1	0	0
CAL YR	2008	TOTAL	712.08	MEAN	1.95	MAX	29	MIN	0	AC-FT	1410	
WTR YR	2009	TOTAL	650.70	MEAN	1.78	MAX	24	MIN	0	AC-FT	1290	

MAX DISCH: 34.3 CFS AT 16:00 ON May. 26,2009 GH 1.25 FT. SHIFT 0 FT.

MAX GH: 1.25 FT. AT 16:00 ON May. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DEADMAN DITCH NEAR DEADMAN PARK
WY2009 HYDROGRAPH



PLATTE RIVER BASIN

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME

Water Year 2009

Location.-- Lat. 40°54'31", Long. 105°46'43"; Diverts water from Sand Creek and Deadman Creek in Laramie River basin to Sheep Creek (tributary to North Fork Cache la Poudre River) in sec. 23, T.11 N., R.75 W., in the Cache la Poudre River basin.

Drainage and Period of Record.-- N/A.

Equipment.-- Satellite telemetry and an F-type, graphic water-stage recorder at a 10 foot Parshall flume with a staff gage. Gage is referenced with an inside drop tape.

Hydrographic Conditions.-- This was an average year for snow-pack. The ditch started May 7th and turned off August 4th.

Gage-Height Record.-- Primary record is the hourly averages of 15-minute data taken from satellite monitoring, with the chart as a back up. The record is complete and reliable. The satellite equipment was brought online May 7th by Mark Simpson. The gage was visited twice during the season by a hydrographer and was found to be reading accurately both visits. The peak gage height of 1.64 ft occurred at 1945 on May 26.

Datum Corrections.-- Levels were run across the crest of the flume and to the inside gage on August 6, 2009. The tape was found to be reading accurately. A new Reference Mark; Number 2 (R.M.#2) was established on the top of the downstream right wing wall, Elevation = 3.948 ft.

Rating.-- A standard 10-ft Parshall flume rating is used. No measurements were made this water year. The peak flow of 86.9 cfs occurred at 1945 on May 26, 2009 at a gage height of 1.64 ft with a zero shift.

Discharge.-- Shifts have been zero or adjusted to zero in the past. With levels being run and no conditions documented which would adversely affect the flume operation, this practice was continued.

Special Computations.-- May 8 and 9 were deemed ice affected and estimated.

Remarks.-- Record is good except for May 8 and 9 which were ice affected and considered fair. Water was run from May 7 -I August 4, when the ditch was shut off. Record developed by Lee Cunning .

Recommendations.-- Make measure ments at the gage.

STATE OF COLORADO
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06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME

RATING TABLE-- STD10FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	48	3.8	2.4	0
2	0	0	0	0	0	0	0	0	62	4.2	1.6	0
3	0	0	0	0	0	0	0	0	50	6	0.89	0
4	0	0	0	0	0	0	0	0	47	6.2	0.22	0
5	0	0	0	0	0	0	0	0	37	9.8	0	0
6	0	0	0	0	0	0	0	0	32	6.6	0	0
7	0	0	0	0	0	0	0	1.7	28	3.7	0	0
8	0	0	0	0	0	0	0	3	39	2.5	0	0
9	0	0	0	0	0	0	0	4	36	1.7	0	0
10	0	0	0	0	0	0	0	3.9	37	1.1	0	0
11	0	0	0	0	0	0	0	5.4	24	0.76	0	0
12	0	0	0	0	0	0	0	11	21	2.8	0	0
13	0	0	0	0	0	0	0	17	12	1.8	0	0
14	0	0	0	0	0	0	0	15	8.5	0.93	0	0
15	0	0	0	0	0	0	0	13	7.7	0	0	0
16	0	0	0	0	0	0	0	21	4.1	1.5	0	0
17	0	0	0	0	0	0	0	32	1.6	2	0	0
18	0	0	0	0	0	0	0	39	1.3	1.9	0	0
19	0	0	0	0	0	0	0	44	0.65	1.8	0	0
20	0	0	0	0	0	0	0	47	0.21	1.8	0	0
21	0	0	0	0	0	0	0	49	1.5	1.6	0	0
22	0	0	0	0	0	0	0	44	7.9	1.8	0	0
23	0	0	0	0	0	0	0	45	10	1.6	0	0
24	0	0	0	0	0	0	0	54	9.3	1.3	0	0
25	0	0	0	0	0	0	0	60	8.5	1.3	0	0
26	0	0	0	0	0	0	0	73	8.2	1.6	0	0
27	0	0	0	0	0	0	0	56	7.6	2.5	0	0
28	0	0	0	0	0	0	0	48	5.9	4.4	0	0
29	0	0	0	0	---	0	0	44	5	4.6	0	0
30	0	0	0	0	---	0	0	41	4.5	4.4	0	0
31	0	---	0	0	---	0	---	41	---	2.5	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	812.00	565.46	88.49	5.11	0.00
MEAN	0	0	0	0	0	0	0	26.2	18.8	2.85	0.16	0
AC-FT	0	0	0	0	0	0	0	1610	1120	176	10	0
MAX	0	0	0	0	0	0	0	73	62	9.8	2.4	0
MIN	0	0	0	0	0	0	0	0	0.21	0	0	0

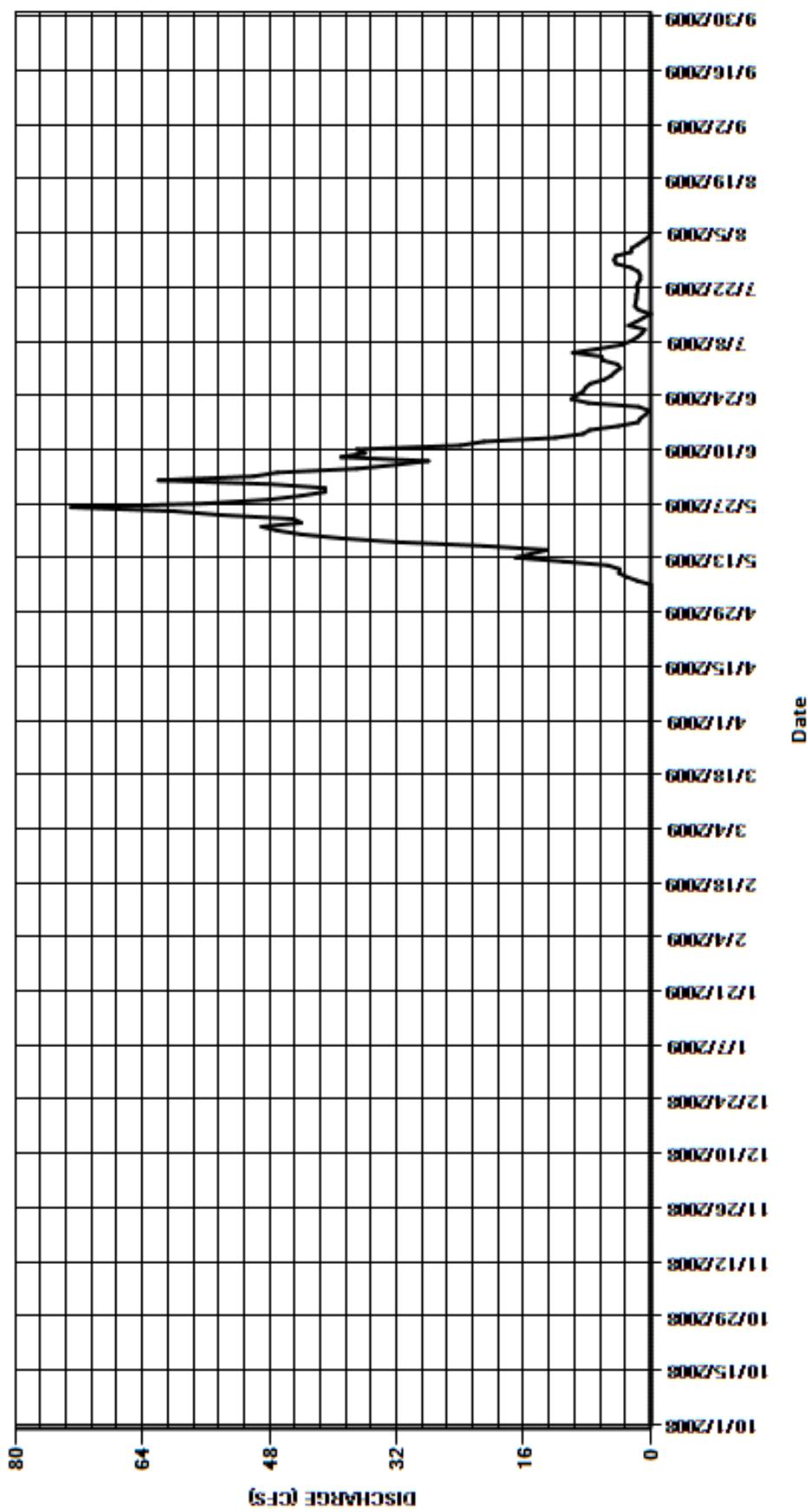
CAL YR	2008	TOTAL	2134.59	MEAN	5.83	MAX	101	MIN	0	AC-FT	4230
WTR YR	2009	TOTAL	1471.06	MEAN	4.03	MAX	73	MIN	0	AC-FT	2920

MAX DISCH: 86.9 CFS AT 19:45 ON May. 26,2009 GH 1.64 FT. SHIFT 0 FT.

MAX GH: 1.64 FT. AT 19:45 ON May. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT MARSHALL FLUME
WY2009 HYDROGRAPH



REPUBLICAN RIVER BASIN

PIONEER DITCH

Water Year 2009

Location.--	Lat. 40°05'05", Long. 102°08'30", SW¼NE¼ sec. 2, T.1 N., R.43 W., Yuma County, 4 mi east of Wray, Co., 1000 ft south of U.S. Highway 34.
Drainage and Period of Record.--	N/A
Equipment.--	Digital Incremental Sutron 8500 (Black) shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) transmitting hourly, a Steven's Type F weekly graphic recorder in a metal box enclosure and well section at a 5-foot Parshall flume in a concrete lined canal. The canal is equipped with a timber suspended in the flow to slow down velocities into the flume. The primary reference is the outside staff gage.
Hydrographic Conditions.--	The Pioneer Ditch is a controlled diversion from North Fork of the Republican River, which is derived from underground sources and sand hill plains storm runoff. Diversion is regulated by obligations to the states of Kansas and Nebraska under the Republican River Compact .
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute shaft encoder data with chart record as backup. The record is complete and reliable. The gage is a seasonal gage. On October 17, 2008, State of Colorado personnel turned off satellite telemetry for winter. On April 15, 2009 State of Colorado personnel set the chart and turned the satellite telemetry back on. Both chart and shaft encoder (SE) were set to 0.00, but this practice was ruled out for future operation. Due to mud in the well, GH cannot be set at this gage unless there is water in the flume and inlets are flushed. The record is supported by calibration visits recorded on visit sheets. Eight encoder adjustments of +/- 0.05 ft were applied to the record. Additionally, the gage was incorrectly set 0.41 ft too high at start-up on April 27, and was corrected -0.36 ft the next day. A residual GH typically seen from mud in the well after the water turned off. This year GH's below about 0.10 ft were considered zero flow. The following dates the canal was off: October 16, 2008 to April 26, 2009, May 1-10, 20, June 13-14, 17, September 4-8, 25-27, 2009 .
Datum Corrections.--	Levels were run to the crest of the flume on August 24, 2006. The crest was found to be an average of 0.027 ft higher than the staff zero point. This would account for about 0.02 ft of the negative shift seen on the flume. No correction was made to the staff.
Rating.--	The concrete canal is trapezoidal and has a concave transition to the flume. (This is opposite the traditional modified Parshall transition.) The canal was originally dirt, and when it was lined the flume approach velocities greatly increased. A timber was suspended in the flow above the flume to dissipate energy, and accumulation of weeds and trash on the timber has caused unpredictable velocity variations across the flume. The canal is straight above and below the flume. Submergence is not a problem. Control is a 5-foot steel Parshall Flume. A standard 5-foot Parshall Flume rating, STD05FTP, was used again this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 5 ft Parshall Flume is 1.56 to 85.6 cfs. Anything above or below this range is outside the +/- 5% accuracy range unless defined by measurements. Only a few days had flows recorded below the defined range. Colorado Water Resources and Nebraska Natural Resources personnel made twenty-one measurements (Nos. 676 – 698) during the 2009 water year. They ranged in discharge from 3.24 to 26.2 cfs. The peak flow of 31.4 cfs occurred at 0930 on May 18, 2009 at a gage height of 1.36 ft with a shift of -0.03 ft. It exceeded measurement no. 693, made September 1, 2009 by 0.14 ft in stage.
Discharge.--	Shifting control method was used the entire year. Approach velocities cause shifts. Trash on the timber above the gage visibly affected flow distribution in the flume and could account for some variability in the shifts. Moss and sediment in the canal can also have some slight effects on the flume. Given the variability of approach conditions over time, time shifting is used. Measurements show unadjusted shifts varying between 0.00 and -0.10 feet. Shift adjustments are made to average out shifts, since a particular shift may be transitory. Straight time shifting was used with no consideration to stage, since stage effects would be due to control changes and the control is not changing here—only the approach conditions. In 2009, most CDWR measurements were made twice—once with a Price AA meter and again with the Price Pigmy meter. This was done as a check on the vertical velocity distribution. All such duplicated measurements differed in shift, and in all cases an average shift was arrived at by adjustment. Between shift averaging for time and for meter type, 17 of the 21 measurements made were adjusted, 7 with plus adjustments and 10 with minus adjustments. Only one measurement was adjusted more than 5%. Nebraska measurement 681, made on June 4, 2009, was adjusted -9 % from -0.05 ft. to -0.03 ft. This was done strictly to average out the shift variability and not due to any discernable problem with the measurement. In general, Nebraska measurements are reviewed each year for consistency in width, depth and velocities as compared to Colorado measurements. By agreement all measurements are made at an angle iron brace 6.0 ft. in width at the staff cross section. Measured depths are usually quite close to the staff GH, which gives reasonability check on depths. Velocities are compared with Colorado measurements that are close in time and at similar GH. No inconsistencies were noted with 2009 Nebraska measurements, and all (Nos. 676, 681, 685, 690, 693, and 696) were used.
Special Computations.--	State of Colorado personnel did some comparison between the AA meters and Mag Pygmy meters. The measurements were both used and adjusted in the middle of the two.
Remarks.--	The record is good, except for June 12, 16, September 23-24, 2009 which are considered fair since they were below the defined range for a 5-foot Parshall flume. Station maintained by Devin Ridnour and record developed by Devin Ridnour and Bob Cooper.

Recommendations.--

Levels should be run this coming water year. Do not make SE or Pen corrections when the ditch is off and the floats are bottomed out. Make sure the SE and pen floats are clear of each other and the well cylinder. Cooperation between the Colorado Hydrographer/Water Commissioner and Nebraska personnel has been helpful in arriving at consistent measurement techniques at this flume. Nebraska's spin times could be documented better. At the start of next season we should again meet with Nebraska and ask them to write on our visit sheets and compare notes on technique. The pygmy meter should always be used at this flume, but if one State uses it and the other does not, then there may be problems with shifts.

STATE OF COLORADO
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PIONEER DITCH

RATING TABLE--

STD05FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	0	0	0	0	0	0	0	12	18	21	27
2	11	0	0	0	0	0	0	0	7.6	17	21	28
3	11	0	0	0	0	0	0	0	5.4	18	22	19
4	11	0	0	0	0	0	0	0	4.9	20	26	0
5	9.1	0	0	0	0	0	0	0	4.7	20	26	0
6	8.8	0	0	0	0	0	0	0	6.3	19	26	0
7	11	0	0	0	0	0	0	0	12	22	19	8.9
8	12	0	0	0	0	0	0	0	7.3	20	8.2	24
9	11	0	0	0	0	0	0	0	3.2	21	15	24
10	9.3	0	0	0	0	0	0	0	0	11	20	26
11	9.2	0	0	0	0	0	0	7.6	0	9.1	25	25
12	7.4	0	0	0	0	0	0	10	2.1	13	23	20
13	4.8	0	0	0	0	0	0	11	4.5	24	24	19
14	6.2	0	0	0	0	0	0	14	4.1	25	26	19
15	4.7	0	0	0	0	0	0	17	3.5	23	24	21
16	0	0	0	0	0	0	0	20	1.1	25	24	24
17	0	0	0	0	0	0	0	22	0	27	25	23
18	0	0	0	0	0	0	0	20	2.5	28	26	23
19	0	0	0	0	0	0	0	4.4	7.6	23	26	23
20	0	0	0	0	0	0	0	0	7.5	22	23	23
21	0	0	0	0	0	0	0	4.1	5.1	25	24	23
22	0	0	0	0	0	0	0	16	2.8	26	26	19
23	0	0	0	0	0	0	0	17	4.9	25	26	1.4
24	0	0	0	0	0	0	0	19	7.5	24	22	0.53
25	0	0	0	0	0	0	0	21	11	24	14	0
26	0	0	0	0	0	0	0	14	11	25	11	0
27	0	0	0	0	0	0	5.5	8.2	11	17	11	0
28	0	0	0	0	0	0	11	5	12	15	13	4.5
29	0	0	0	0	---	0	8.7	7.5	15	13	15	12
30	0	0	0	0	---	0	2.6	14	16	13	17	12
31	0	---	0	0	---	0	---	14	---	19	24	---
TOTAL	137.50	0.00	0.00	0.00	0.00	0.00	27.80	265.80	192.60	631.1	653.2	449.33
MEAN	4.44	0	0	0	0	0	0.93	8.57	6.42	20.4	21.1	15
AC-FT	273	0	0	0	0	0	55	527	382	1250	1300	891
MAX	12	0	0	0	0	0	11	22	16	28	26	28
MIN	0	0	0	0	0	0	0	0	0	9.1	8.2	0

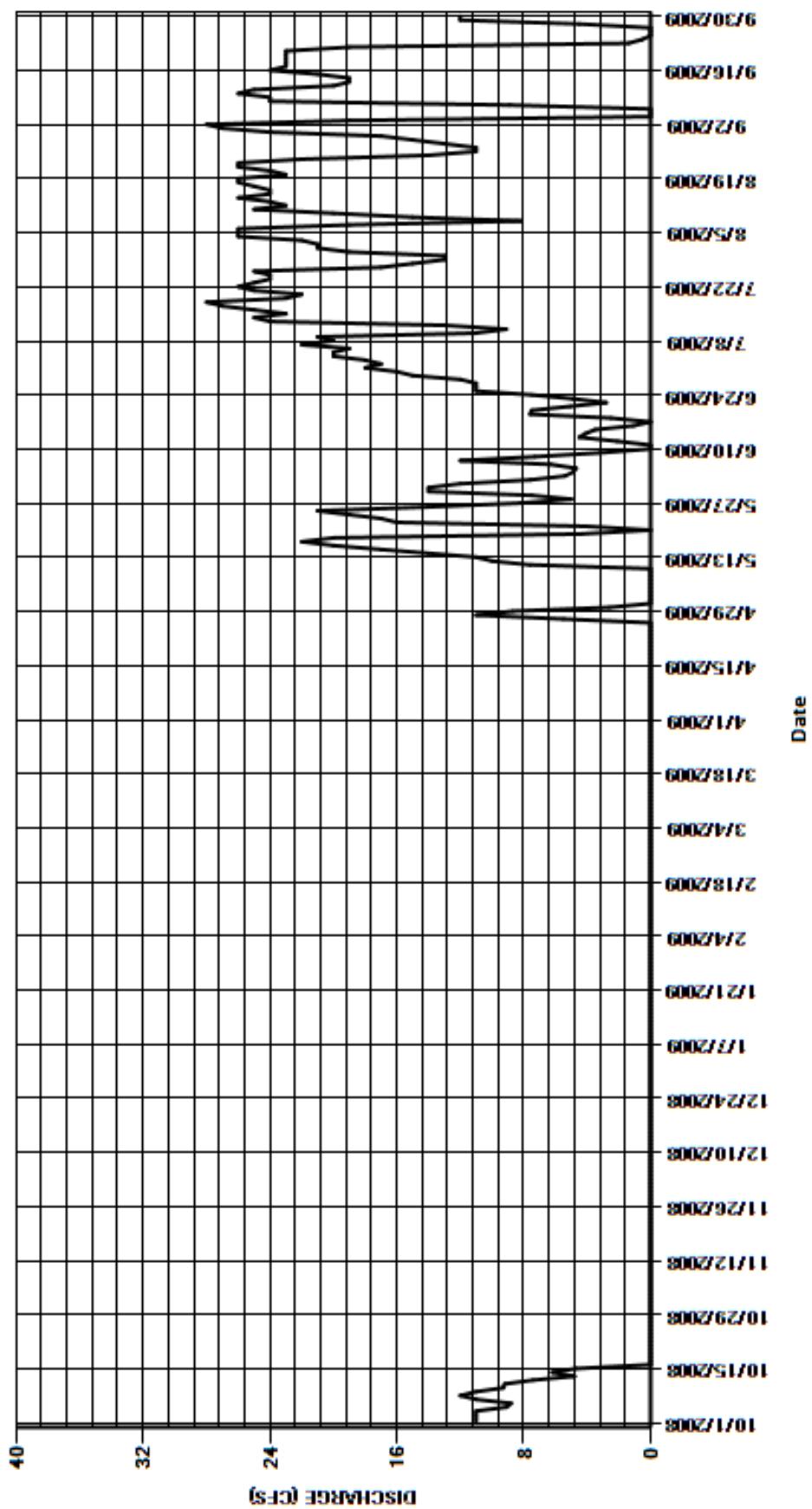
CAL YR	2008	TOTAL	2937.80	MEAN	8.03	MAX	28	MIN	0	AC-FT	5830
WTR YR	2009	TOTAL	2357.33	MEAN	6.46	MAX	28	MIN	0	AC-FT	4680

MAX DISCH: 31.4 CFS AT 09:30 ON May. 18,2009 GH 1.36 FT. SHIFT -0.03 FT.

MAX GH: 1.36 FT. AT 09:30 ON May. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH
WY2009 HYDROGRAPH



REPUBLICAN RIVER BASIN
PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE
Water Year 2009

Location.--	Lat. 40°03'25", Long. 102°03'10", SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 10, T.1 N., R.42 W., Yuma County; 1200 ft south of U.S. Highway 34 at Colorado/Nebraska State line.
Drainage and Period of Record.--	N/A.
Equipment.--	Digital Incremental Sutron 8500 (Black) shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) transmitting hourly, a Steven's Type F weekly graphic recorder in a metal box enclosure and well section at a 4-foot Parshall flume.. The site has two outside vertical enameled steel staffs (Ha-Hb, with the Hb staff set with 4.0 ft = 0.0). The Ha staff is the primary reference . Station maintained by Pioneer Ditch Company.
Hydrographic Conditions.--	The Pioneer Ditch is a controlled diversion from North Fork of the Republican River, which is derived from underground sources and sand hill plains storm runoff. This gage measures water delivered to Nebraska under the Republican River Compact.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute shaft encoder data with chart record as backup. The record is complete and reliable, except for the period Aug 3-12 when pondweed caused the flume to flow submerged. Recorded gage heights less than 0.05 feet were considered zero feet due to the float being beached on the mud in the stilling well. If it is noted the ditch was off on visit logs and some residual GH's were between 0.00 and 0.05 ft, then flow was considered zero. Ditch was off for periods of time as follows: October 17, 2008 through April 26, 2009 (off for winter), May 20, June 11, 17, 18, September 5-6, 2009. Special periods of flow occurred on the following days: April 18-20, 2009 (ditch was off but rain water came in below headgate); May 1-10, 2009 (ditch was off but had rain water and natural spring water). Seven datum corrections were applied, using water commissioner visits to support the proration. A large correction (+0.20 ft) was required for the April 18-20 rainwater-in-the-ditch event, because recorder zero had not been established. Other corrections were related to incorrect zero readings on the recorders, but the corrected record periods were accurate due to prompt visits when water started up.
Datum Corrections.--	Levels were last run to the crest of the flume on August 24, 2006. The flume was found to be out of level laterally, with the right side (stilling well intake side) found to be about 0.08 ft lower than the left (staff gage side). This accounts for a part of the positive shifts being measured. No correction was made to the staff.
Rating.--	The control is a 4-foot steel Parshall Flume with concrete sidewalls in a dirt canal. A standard 4-foot Parshall Flume table was used this water year. Heavy vegetation builds up on the sides and bottom of the ditch and projects into the flume and narrows the approach. Vegetative growth downstream can also cause submergence. A positive shift can arise from the tilt and the slightly warped geometry of the flume. Encroachment of the flume wing walls into the flume entrance section and the resulting turbulence wake also is contributing to the positive shift and may also cause variability in staff gage readings and/or the need for gage height corrections to the shaft encoder. Colorado/Nebraska Water Resources personnel made twenty-three measurements (Nos. 673-695) during the 2009 water year. They ranged in discharge from 3.29 to 22.9 cfs. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 4 ft Parshall Flume is 1.26 to 67.9 cfs. Anything above or below this range is outside the +/-5% accuracy range unless defined by measurements. Flows in this range were recorded during April 18-20, 2009, and momentarily on days when water was started or shut down. Peak flow of 25.1 cfs occurred at 1415 on Aug 23, 2009 at a gage height of 1.27 ft with a shift of +0.06 feet. The peak gage height of 1.38 ft occurred at 1415 on August 7, 2009 and exceeded Measurement No. 688 and 689 made August 7, 2009 by 0.01 ft (during the submergence of the flume).
Discharge.--	Time shifting method was used for the year. Measurements for good record show unadjusted shifts varying between +0.04 and + 0.11 feet. Measurements 688 and 689 unadjusted shifts were -0.16 ft and -0.13 ft due to pond weed causing submergence. In 2009, most CDWR measurements were made twice—once with a Price AA meter and again with the Price Pigmy meter. This was done as a check on the vertical velocity distribution. All such duplicated measurements differed in shift, and in all cases an average shift was arrived at by adjustment. Most shifts were adjusted to smooth distribution. Of the 21 good record measurements, 8 were adjusted 0 to -5%, 4 were adjusted 0 to + 2% , one (No. 673) was adjusted + 10%, and one (No. 695) was adjusted -7%. In the latter two measurements the higher adjustments were meant to compensate for measurement depths inconsistent with previous measurements. Discharges computed when pondweed shifts were used (August 3-12) were consistent with flows from the headgate and were considered "Fair". Discharge during May 1- 10 was estimated from water commissioner observations of water accruing in the ditch when the headgate was shut off.
Special Computations.--	Special distribution was done during the period when pondweed submerged the flume; the submergence was confirmed by back-to-back measurements 688 and 689, which were adjusted to a -0.13 ft shift. Back-to-back AA meter and Mag-head Pygmy meter measurements were adjusted to an average shift. Heavy rains and some natural springs will cause flows to show up at the flume. During the winter months an earth dam is in place to let the natural springs to flow to the North Fork Republican River. During the period of May 1-10, 2009 there was water with unreliable gage heights. During that period the daily flows were estimated from visits made by the local water commissioners. The record is compared with Pioneer Ditch at the Headgate figures to make sure no Stateline flows are inconsistent with the amounts diverted above.
Remarks.--	The record is good, except for the following: May 1-10, 2009 is estimated and poor; August 3-12 is fair due to pondweed backwater effect; Flows were below the accuracy range for a four-foot Parshall flume on Apr 18-20, and there was also a large calibration correction on these days, thus they are downgraded to poor. This is a seasonal gage used for the Republican River Compact. Record developed by Devin Ridnour and Bob Cooper.

Recommendations.--

Levels should be run this coming water year. Do not make SE or Pen corrections when the ditch is off and the floats are bottomed out. Make sure the SE and pen floats are clear of each other and the well cylinder. If possible, back-to-back measurements with Nebraska should be arranged to compare technique.

STATE OF COLORADO
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PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE

RATING TABLE--

STD04FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	0	0	0	0	0	0	0.09	12	16	20	21
2	10	0	0	0	0	0	0	0.09	9	15	20	22
3	10	0	0	0	0	0	0	0.09	5.4	16	20	21
4	10	0	0	0	0	0	0	0.09	5	17	22	1.1
5	9.1	0	0	0	0	0	0	0.09	4.4	18	21	0
6	7.9	0	0	0	0	0	0	0.09	4.8	17	21	0
7	8.7	0	0	0	0	0	0	0.09	11	19	20	1.3
8	11	0	0	0	0	0	0	0.09	8.8	18	3.7	19
9	9.6	0	0	0	0	0	0	0.09	3.9	18	5.3	20
10	8.1	0	0	0	0	0	0	0.09	0.33	13	14	21
11	8.1	0	0	0	0	0	0	4.3	0	8.6	20	22
12	8.1	0	0	0	0	0	0	9.5	0.47	9.1	21	19
13	3.3	0	0	0	0	0	0	9.1	4.5	19	21	17
14	5.2	0	0	0	0	0	0	12	3.9	21	22	17
15	5	0	0	0	0	0	0	14	3.6	21	21	17
16	0.38	0	0	0	0	0	0	16	1.7	21	20	20
17	0	0	0	0	0	0	0	18	0	23	22	21
18	0	0	0	0	0	0	1.2	18	0	23	23	21
19	0	0	0	0	0	0	0.8	6.7	6.5	21	23	21
20	0	0	0	0	0	0	0.43	0	6.7	19	22	21
21	0	0	0	0	0	0	0	0.35	5.5	22	20	21
22	0	0	0	0	0	0	0	14	2.4	23	24	21
23	0	0	0	0	0	0	0	15	3.6	23	25	4.7
24	0	0	0	0	0	0	0	17	5.9	22	23	1.1
25	0	0	0	0	0	0	0	20	9.7	22	15	0
26	0	0	0	0	0	0	0	16	9.9	23	9.5	0
27	0	0	0	0	0	0	3	9.7	9.8	20	9.6	0
28	0	0	0	0	0	0	10	5.3	10	14	10	0.56
29	0	0	0	0	---	0	9.1	5.2	13	15	13	12
30	0	0	0	0	---	0	5.2	13	14	11	13	12
31	0	---	0	0	---	0	---	13	---	17	19	---
TOTAL	125.48	0.00	0.00	0.00	0.00	0.00	29.73	237.05	175.80	564.7	563.1	394.76
MEAN	4.05	0	0	0	0	0	0.99	7.65	5.86	18.2	18.2	13.2
AC-FT	249	0	0	0	0	0	59	470	349	1120	1120	783
MAX	11	0	0	0	0	0	10	20	14	23	25	22
MIN	0	0	0	0	0	0	0	0	0	8.6	3.7	0

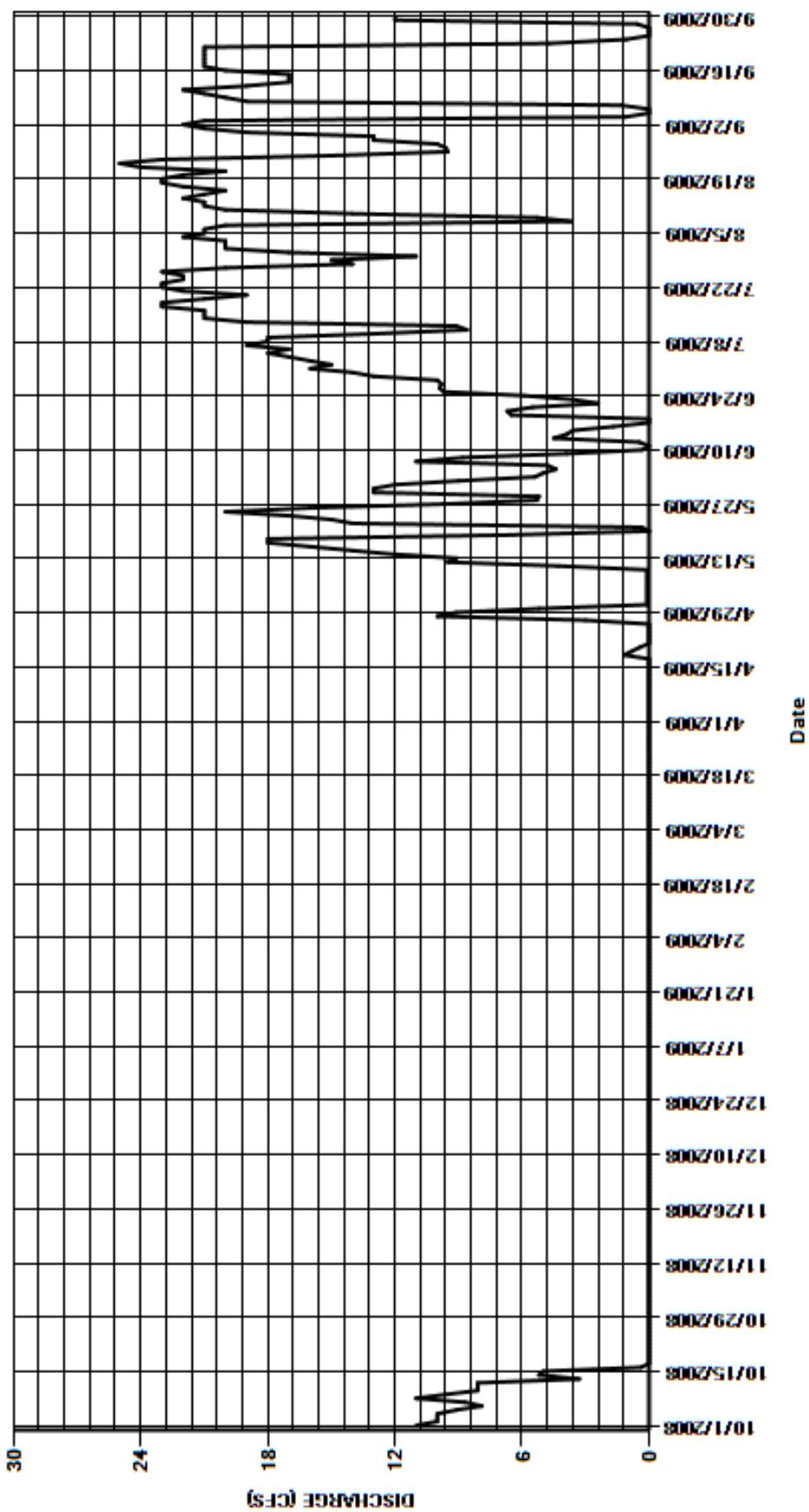
CAL YR	2008	TOTAL	2516.98	MEAN	6.88	MAX	23	MIN	0	AC-FT	4990
WTR YR	2009	TOTAL	2090.62	MEAN	5.73	MAX	25	MIN	0	AC-FT	4150

MAX DISCH: 25.1 CFS AT 19:30 ON Aug. 23,2009 GH 1.27 FT. SHIFT 0.06 FT.

MAX GH: 1.38 FT. AT 14:15 ON Aug. 07,2009 (Pondweed Backwater)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE
Water Year 2009

Location.-- Lat. 39°15'05", Long. 106°22'28", Lake County, SE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, T.9 S., R.80 W., on right bank 4.2 miles upstream from junction of Lake Fork Creek and Arkansas River.

Drainage and Period of Record.-- 27.55 sq. mi.

Equipment.-- Satellite-monitored data collection platform (Sutron high data rate SatLink Logger) and shaft encoder in 42-inch diameter corrugated metal pipe (CMP) shelter and concrete well with Sutron Stage Discharge Recorder (SDR) for backup purposes. Shaft encoder and SDR set to inside electric tape gage mounted on instrument shelf. Outside staff gage also used for reference purpose. Shelter is equipped with AC power for well heater. Control is a concrete weir/ apron with ogee lip, tapered lower from the left to right bank, located at the gage.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and SDR record as backup. Record is complete and reliable.

Datum Corrections.-- Levels were last run on May 31, 2007, from BM#3 to the RP. No corrections were needed.

Rating.-- The control is a 38-ft. wide, concrete weir/apron with ogee lip. Rating No. 4A, dated Oct. 1, 1975, was used all water year. It is well defined to about 350 cfs. One discharge measurement (Nos. 566) of 2.58 cfs was made during the year. The peak flow of 480 cfs on June 29, 2009 at 0500 (GH = 2.06 ft, shift = +0.11) exceeded the stage of measurement No.566, by 1.81 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts appear to be affected by control conditions, mainly moss growth and gravel build up above the control. Shifts were applied as defined by measurements and distributed by time for the period Oct 1-Oct 29, 2008; and distributed by variable shift curve LFCBSLCOVS09 for the remainder of the water year. This stage shift relationship is based on historical measurements, which clearly show a relationship of increasingly positive shifts as stage increases.

Special Computations.--

Remarks.-- Record is considered good. Station maintained and record developed by Cheston Hart.

Recommendations.-- Levels need to be run in WY2010 to verify the PZF and previous levels, as the levels history indicates a correction to the ET index elevation may be warranted. Once this has been accomplished, the rating should be evaluated for possible revision. High water measurements cannot be made at the gage at this time. A bank-operated cableway or the potential for using the existing condemned cableway for ADCP measurement at high water should be investigated.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE

RATING TABLE--

LFCBSLCO04A USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.4	2.4	3.1	3.1	3.1	3.1	5.7	17	17	411	17	3.1
2	3.4	2.4	3.1	3.1	3.1	3.1	5.7	19	17	402	17	3.1
3	3.4	2.6	3.1	3.1	3.1	3.1	5.7	22	17	402	17	3.1
4	3.6	3	3.1	3.1	3.1	3.1	5.7	21	17	398	17	3.1
5	3.7	3.1	3.1	3.1	3.1	3.1	5.7	20	17	400	17	3.1
6	3.7	3.1	3.1	3.1	3.1	3.1	5.7	20	17	400	17	3.1
7	3.5	3.1	3.1	3.1	3.1	3.1	5.7	19	18	382	17	3.1
8	3.4	3.1	3.1	3.1	3.1	3.1	5.7	18	18	355	17	3.1
9	3.3	3.1	3.1	3.1	3.1	3.1	5.7	18	18	325	17	3.1
10	2.6	3.1	3.1	3.1	3.1	3.1	5.7	18	17	281	17	3.1
11	2.6	3.1	3.1	3.1	3.1	3.1	5.7	18	17	217	17	3.1
12	2.6	3.1	3.1	3.1	3.1	3.1	5.4	18	17	201	16	3.1
13	2.6	3.1	3.1	3.1	3.1	3.1	5.4	18	17	169	16	3.1
14	2.6	3.1	3.1	3.1	3.1	3.1	5.5	18	18	78	16	3.1
15	2.6	3.1	3.1	3.1	3.1	3.1	5.5	18	18	17	16	3.1
16	2.6	3.1	3.1	3.1	3.1	3.1	5.4	18	18	17	16	3.1
17	2.6	3.1	3.1	3.1	3.1	3.1	5.3	18	18	17	16	3.1
18	2.6	3.1	3.1	3.1	3	3.1	5.3	18	69	17	16	3.1
19	2.6	3.1	3.1	3.1	3.1	3.2	5.3	18	195	17	16	3.2
20	2.6	3.1	3.1	3.1	3.1	3.4	5.3	17	283	18	10	3.3
21	2.6	3.1	3.1	3.1	3.1	3.4	5.4	17	365	18	7	3.4
22	2.6	3.1	3.1	3.1	3.1	3.4	9.7	17	402	18	7.2	3.4
23	2.6	3.1	3.1	3.1	3.1	3.4	15	17	422	18	7.8	3.4
24	2.6	3.1	3.1	3.1	3.1	4.6	16	17	427	18	6	3.4
25	2.6	3.1	3.1	3.1	3.1	5.7	16	17	426	17	3.1	3.4
26	2.6	3.1	3.1	3.1	3.1	5.7	16	17	428	17	3.1	3.4
27	2.6	3.1	3.1	3.1	3.1	5.7	17	17	430	17	3.1	3.4
28	2.6	3.1	3.1	3.1	3.1	5.7	17	18	430	17	3.1	3.4
29	2.5	3.1	3.1	3.1	---	5.7	17	18	431	17	3.1	3.2
30	2.4	3.1	3.1	3.1	---	5.7	17	17	420	17	3.1	3.1
31	2.4	---	3.1	3.1	---	5.7	---	17	---	17	3.1	---
TOTAL	88.1	91.0	96.1	96.1	86.7	117.1	257.2	560	5024	4715	374.7	95.8
MEAN	2.84	3.03	3.1	3.1	3.1	3.78	8.57	18.1	167	152	12.1	3.19
AC-FT	175	180	191	191	172	232	510	1110	9970	9350	743	190
MAX	3.7	3.1	3.1	3.1	3.1	5.7	17	22	431	411	17	3.4
MIN	2.4	2.4	3.1	3.1	3	3.1	5.3	17	17	17	3.1	3.1

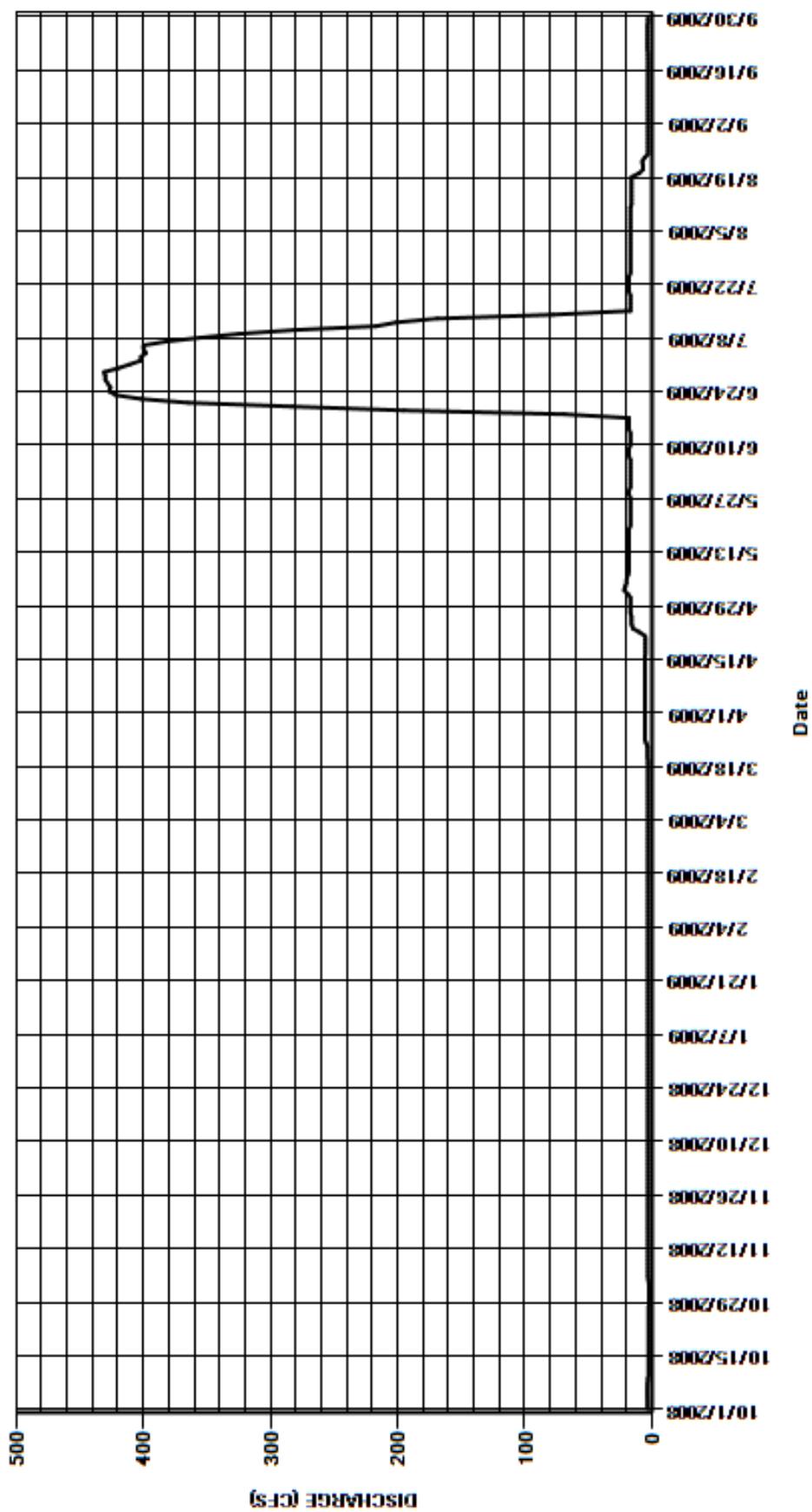
CAL YR	2008	TOTAL	7677.2	MEAN	21	MAX	293	MIN	2.4	AC-FT	15230	
WTR YR	2009	TOTAL	11601.8	MEAN	31.8	MAX	431	MIN	2.4	AC-FT	23010	

MAX DISCH: 480 CFS AT 05:00 ON Jun. 29,2009 GH 2.06 FT. SHIFT 0.11 FT.

MAX GH: 2.06 FT. AT 05:00 ON Jun. 29,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR
Water Year 2009

Location.-- Lat 39°03'47", Long 106°24'28" (Mt. Elbert, Colorado quadrangle, 1:24000 scale), in NE1/4 SE1/4 Sec. 26, T11S, R81W, Lake County, Hydrologic Unit 11020001, on left bank at refurbished concrete section and bridge over Lake Creek originally established by US Forest Service, 1.35 mile upstream from high water line of Twin Lakes Reservoir, 0.65 miles upstream from Willis Creek tributary, and 2.1 miles southwest of village of Twin Lakes CO.

Drainage and Period of Record.-- 75 mi². April 1946 to Sept. 1962, Oct. 1963 to current year. Monthly data only for some periods.

Equipment.-- A Sutron constant flow bubbler sensor and satellite-monitored data collection platform (Sat-Link 2 DCP) in a 4' x 4' metal shelter. Primary reference gage is a drop wire weight mounted on the pedestrian bridge over the control. A temperature sensor is operated at the site. Control is a 25-ft. long by 41.8 ft. wide concrete apron .

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable, except for the following periods: Oct 23-24, 2008, when ice affected the stage discharge relationship, and, Oct 27, 2008 – April 14, 2009, when the station was closed for the winter.

Datum Corrections.-- Levels were last run May 9, 2006.

Rating.-- The control is a 25-ft. long by 41.8 ft. wide concrete apron edged with angle iron on the upstream & downstream sides. It also serves as a measuring base, since it is located directly under the bridge. High water measurements are made from the bridge that is over the concrete section, utilizing a portable bridge crane. Wading measurements are made on the same concrete apron during winter as this section stays more open than surrounding sections, although considerable ice breaking is required. Outside of winter, wading measurements are made downstream at the old gage location as flow is more laminar and steady there. Thirteen discharge measurements (Nos. 984-996) were made during the water year, ranging in discharge from 12.7 to 1050 cfs. They cover the range in stage experienced, except higher daily flows of May 15-24, 31; June 1, 20, 23-28, 2009. The peak occurred at 2015, May 18, 2009 (Q= 1950 cfs, GH= 5.98 ft. shift= 0.05) and exceeded maximum flow measurement No. 994, made June 18, 2009, by 1.34 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record until gage was shut down for winter on Oct 27, 2008. Shifts were applied as defined by measurements and were distributed by stage from 0000 hrs. 10/1/08 to 1721 hrs. 05/08/2009, and 1500 hrs. 8/17/09 to 2350 hrs. 9/30/2009. LAKAVSHF09 shift curve was used from 1800 hrs. 5/7/09 to 1437 hrs. 8/17/2009. Open water measurements for this period indicated shifts varying from -0.13 to 0.13 ft. During this period, all measurements were given full weight and applied directly except for measurements 991, 992, 994, 995 which were adjusted from 8% to -8%. Shifts are found to become more negative in the later part of the WY due to lower flows and filling of large boulders above the control. Given this scenario shifts are applied by time once the approach becomes filled causing irregular flows on the control. Whether wading or cabling, the velocities are in the extreme range and this station is difficult to measure. This is especially so for cabling. For any flows above about 500 cfs a 100 lb. weight is required, and the depths are so shallow that placing the meter in the correct velocity profile is problematic. Notwithstanding, a number of the measurements, when plotted on a shift diagram, point to the accuracy of rating no. 23 with random errors distributed about it.

Special Computations.-- Discharge for periods of no gage-height or ice affected record were estimated based on record from the upstream station of Twin Lakes Tunnel added to an estimated based flow and adjusted daily from weather records. Estimated base flow is derived from seven measurements (Nos. 986-990). A hydrograph was used in the record analyses.

Remarks.-- Record is good , except for periods of ice effect and no gage height record, which are estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.--

STATE OF COLORADO
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07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR

RATING TABLE-- LAKATLCO23 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

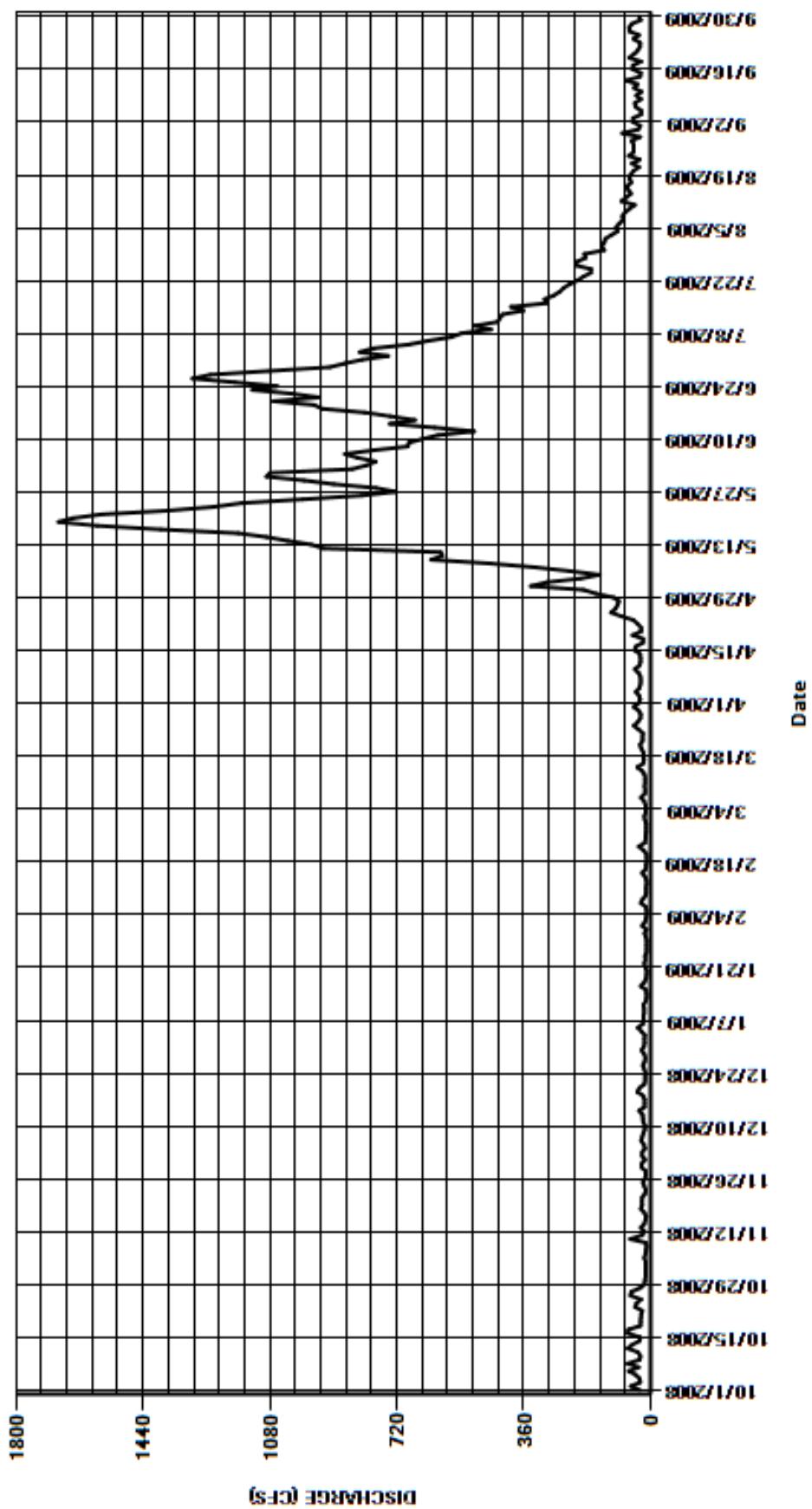
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	14	16	17	24	16	34	190	1080	818	132	29
2	56	14	24	18	16	18	30	340	847	745	129	51
3	30	14	24	16	13	14	33	296	806	825	112	50
4	31	14	16	26	12	14	42	199	780	787	94	27
5	42	18	19	36	12	15	32	144	832	687	98	27
6	62	15	27	22	13	18	29	230	868	631	90	43
7	34	13	24	20	28	28	28	329	786	565	78	45
8	65	12	21	21	23	16	29	455	689	536	80	27
9	31	13	17	18	14	16	34	623	686	453	73	41
10	29	58	16	18	13	17	45	591	647	499	60	26
11	36	24	21	21	13	16	31	596	603	434	45	47
12	65	18	22	14	12	16	29	929	501	428	83	37
13	52	28	23	12	12	17	29	963	613	420	69	70
14	31	18	33	12	16	24	30	1030	740	361	56	30
15	30	15	17	13	24	38	45	1090	669	396	64	28
16	65	13	17	28	14	21	42	1170	739	292	66	52
17	63	18	17	18	13	19	22	1390	811	301	55	50
18	29	28	22	13	12	20	21	1570	932	275	60	27
19	28	24	38	12	12	21	51	1680	955	258	57	61
20	28	25	32	11	12	27	27	1640	1070	247	49	47
21	27	24	18	15	20	30	27	1560	941	230	33	36
22	24	16	16	18	34	23	37	1370	1020	207	53	30
23	44	14	16	15	16	23	49	1240	1130	191	31	30
24	40	18	15	16	15	22	83	1160	1060	170	62	49
25	27	22	18	12	14	34	112	986	1180	169	48	33
26	57	16	22	12	13	48	100	820	1300	214	48	60
27	55	14	17	12	13	36	94	724	1250	208	48	61
28	30	14	15	11	13	29	90	779	1080	184	54	53
29	18	26	18	14	---	28	105	899	911	188	30	28
30	16	25	26	17	---	34	155	984	868	132	80	33
31	15	---	19	12	---	48	---	1090	---	139	35	---
TOTAL	1191	585	646	520	446	746	1515	27067	26394	11990	2072	1228
MEAN	38.4	19.5	20.8	16.8	15.9	24.1	50.5	873	880	387	66.8	40.9
AC-FT	2360	1160	1280	1030	885	1480	3010	53690	52350	23780	4110	2440
MAX	65	58	38	36	34	48	155	1680	1300	825	132	70
MIN	15	12	15	11	12	14	21	144	501	132	30	26
CAL YR	2008	TOTAL	83853	MEAN	229	MAX	1830	MIN	12	AC-FT	166300	
WTR YR	2009	TOTAL	74400	MEAN	204	MAX	1680	MIN	11	AC-FT	147600	

MAX DISCH: 1950 CFS AT 20:15 ON May. 18,2009 GH 5.98 FT. SHIFT 0.05 FT.
MAX GH: 5.98 FT. AT 20:15 ON May. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
LAKE CREEK BELOW TWIN LAKES RESERVOIR
Water Year 2009

Location.-- Lat. 39°04'34", Long. 106°18'35", in NE $\frac{1}{4}$ SE $\frac{1}{4}$, sec. 22, T.11 S., R. 80 W., Lake County, on right bank 1.2 miles upstream from confluence of Lake Creek and Arkansas River and 1500 ft downstream of Twin Lakes Dam.

Drainage and Period of Record.-- N/A.

Equipment.-- Satellite-monitored data collection platform (Sutron high data rate SatLink DCP) and shaft encoder and stage discharge recorder (SDR) on separate floats in a concrete shelter and well. Shaft encoder and SDR are set to an inside electric tape-down mounted on instrument shelf. Outside staff gage installed in flume but generally used as backup to primary reference tape-down gage. Control is a 30-foot concrete Parshall flume. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with the DCP log data and SDR data used for backup purposes. Record is complete and reliable for the entire year.

Datum Corrections.-- Levels were last run on Sept. 6, 2007. Results were well within allowable limits, no corrections were needed/ taken. For the five years prior to that levels results indicated the gage is very stable.

Rating.-- Control at all stages is a 30-ft. concrete Parshall flume. Wading measurements are made in the flume at the staff gage/well intake section, where there are eyebolts on the flume walls to attach a safety cable with 2 ft. markings. The maximum flow that can be safely waded in the flume is about 250 cfs (gage height = 1.61 ft). Flows up to about 400 cfs (gage height = 2.20 ft) can be waded about 150 ft downstream of the flume. There is no bridge at this flume. Approximately 1,000 ft downstream there is a highway bridge across Lake Creek. However, at this point the channel has interception of dam leakage, and the cross-section has large, angular material making crane or round-rod measurements difficult and unreliable. Rating No. 7, a standard 30 ft. Parshall flume table, dated Aug. 4, 1971, was used all year (previous stations had different size flumes and controls). It is well defined at all stages. Two discharge measurements (Nos. 122-123) were made this year with discharges ranging from 105 to 312 cfs. Maximum discharge was 1330 cfs occurring at 2015, June 27, 2009 (gage height = 4.64 ft, shift = 0.03). The maximum gage height exceeded maximum measurement No. 123 by 2.8 ft. in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied and distributed using stage-shift relationship: LAKBTLCOSHF04A, which is based on historical measurements. Current water year measurements showed raw shifts ranging from 0.04 feet to 0.05 feet, but both measurements 122 and 123 were discounted 1% to fit the historical stage-shift relationship.

Special Computations.--

Remarks.-- Record is good, except for periods with mean daily flows above 400 cfs, which is rated fair due to uncertainty of shifts to the standard rating above that flow. The peak flow for the year is also rated fair. Station maintained and record developed by Cheston Hart.

Recommendations.-- Efforts should be made to get high water measurements to better define the stage-shift relationship. At this time the shift curve being used is by agreement between the USBR and DWR, however, it is not well defined above gage heights of about 2.20 ft. StreamPro ADCP measurements should be made in the reach below the flume to better define the shift curve above 2.00 ft in stage.

STATE OF COLORADO
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LAKE CREEK BELOW TWIN LAKES RESERVOIR

RATING TABLE--

STD30FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

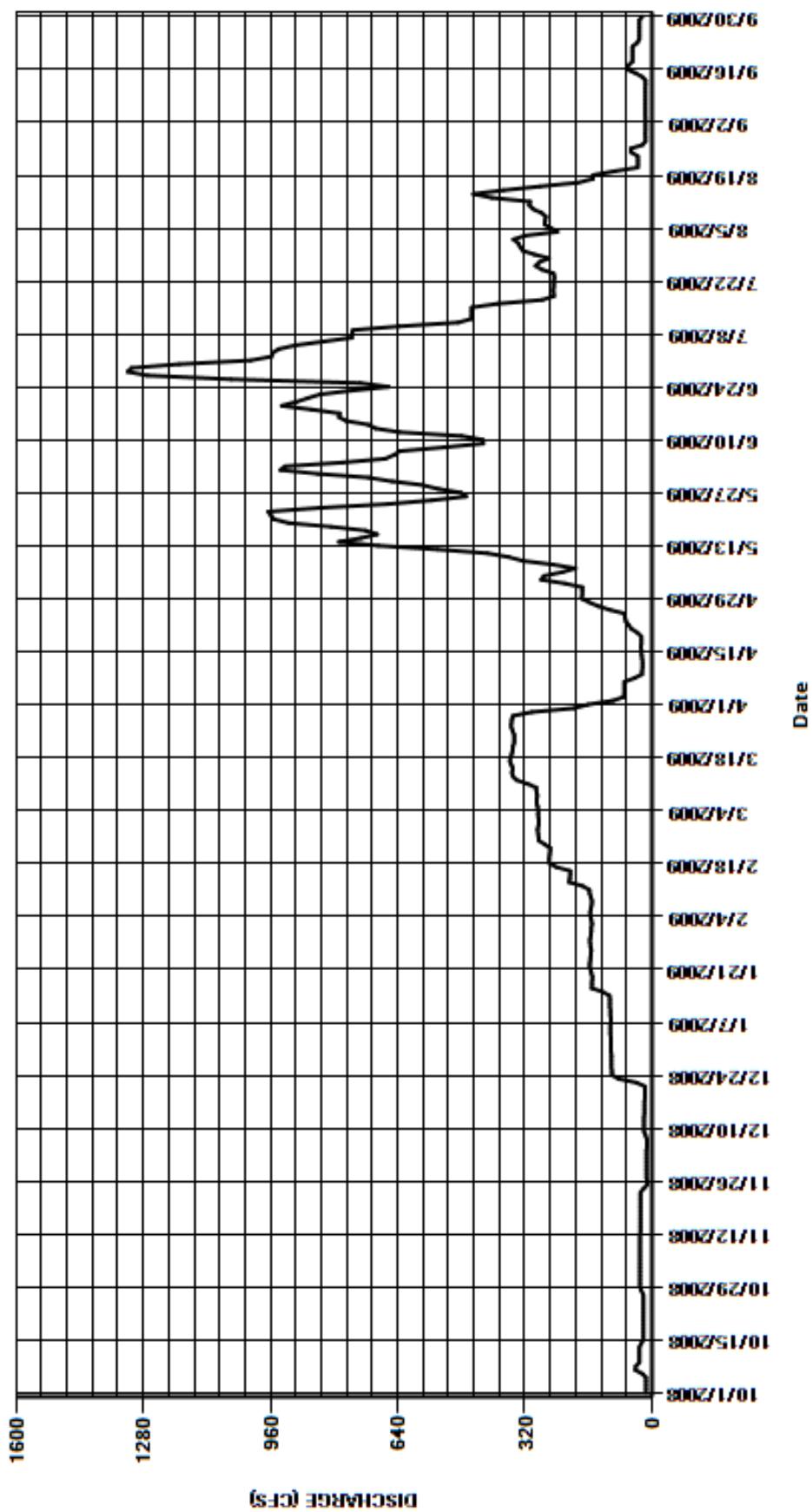
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	30	14	104	153	285	161	176	840	1010	337	16
2	15	30	14	104	151	286	98	175	935	958	349	16
3	15	30	14	104	153	287	71	219	923	955	319	16
4	15	30	14	105	155	286	70	279	778	939	238	17
5	15	30	13	105	156	288	70	272	671	897	255	17
6	24	30	13	105	154	291	70	226	649	826	271	17
7	42	30	13	104	152	290	70	193	635	755	269	17
8	41	30	16	104	151	289	44	249	524	755	267	17
9	32	30	20	105	154	291	25	326	425	753	278	17
10	32	30	20	105	157	291	25	361	426	636	299	17
11	32	30	20	106	158	313	24	415	480	488	309	17
12	32	30	20	106	175	341	24	540	635	454	307	16
13	32	29	20	106	209	350	25	689	696	454	403	16
14	27	29	19	107	207	353	26	788	714	454	450	25
15	22	29	19	124	206	350	26	733	770	454	374	42
16	22	29	19	152	206	354	28	692	788	388	282	64
17	22	29	19	151	241	358	27	721	786	276	187	60
18	22	29	18	151	258	356	27	807	857	247	149	49
19	22	29	18	150	259	353	27	915	932	248	148	49
20	22	29	18	153	258	351	37	952	896	248	95	49
21	22	29	18	155	257	350	52	959	867	247	36	49
22	22	29	39	157	256	347	59	966	836	247	36	49
23	22	29	84	156	270	347	66	837	757	246	36	37
24	22	21	101	155	285	347	68	665	663	248	36	32
25	22	12	101	154	286	351	68	554	735	277	52	32
26	22	13	102	153	287	354	106	468	1060	293	54	32
27	22	14	102	155	288	354	135	481	1270	283	24	32
28	27	14	102	156	286	353	158	538	1320	259	16	32
29	30	14	102	156	---	350	177	576	1310	296	16	32
30	30	14	103	154	---	302	176	654	1190	325	17	24
31	30	---	104	153	---	196	---	713	---	332	16	---
TOTAL	772	781	1299	4055	5928	10014	2040	17139	24368	15248	5925	905
MEAN	24.9	26	41.9	131	212	323	68	553	812	492	191	30.2
AC-FT	1530	1550	2580	8040	11760	19860	4050	34000	48330	30240	11750	1800
MAX	42	30	104	157	288	358	177	966	1320	1010	450	64
MIN	15	12	13	104	151	196	24	175	425	246	16	16
CAL YR	2008	TOTAL	109793	MEAN	300	MAX	1420	MIN	12	AC-FT	217800	
WTR YR	2009	TOTAL	88474	MEAN	242	MAX	1320	MIN	12	AC-FT	175500	

MAX DISCH: 1330 CFS AT 20:15 ON Jun. 27,2009 GH 4.64 FT. SHIFT 0.03 FT.

MAX GH: 4.64 FT. AT 20:15 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LAKE CREEK BELOW TWIN LAKES RESERVOIR
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07086000 ARKANSAS RIVER AT GRANITE
Water Year 2009

Location.-- Lat. 39°02'34", Long. 106°15'55", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, T.11 S., R.79 W., Chaffee County, Hydrologic Unit 11020001, on right bank at Granite, 100 ft east of U.S. Highway 24, 100 ft downstream from county bridge, and 200 ft upstream from Cache Creek.

Drainage and Period of Record.-- 427 mi². Sporadic data from April 1895 to May 1901. Complete data from April 1910 to current year. Monthly data for some periods only.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Satlink 2 DCP) and shaft encoder in 4'x4' steel shelter over a 42" metal pipe well. Shaft encoder and chart set to inside electric tape gage. Stock tank heater used inside well during periods of freezing weather to keep well open. The cableway is approximately 100 feet downstream from gage. A new cable and hardware were installed on the cableway this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for the following periods: December 9-31, 2008, January 4-6, 10, 11, 13, 15, 21, 30, 31, February 2, 4, 5, 11, 12, 15, 2009, when the stage-discharge relationship was affected by ice; and, April 7, 10; May 22-27, 2009, when the DCP data were missing or unreliable due to Satlink 2 malfunction and no chart backup record. The shelter and well are situated on the right bank in calm water subject to significant shore ice, including complete channel and control freeze-over during periods of freezing weather.

Datum Corrections.-- Levels were last run August 8, 2005.

Rating.-- Control is a boulder riffle 150 ft downstream. At high water stages, the channel and banks are the control. Rating No. 11A, was used this water year. It is well defined to 3000 cfs. Eleven discharge measurements (Nos. 372-382) were made during the water year ranging in discharge from 94.5 to 1710 cfs. They cover the range in flows experienced except for the lower daily flows of November 24-25, 2008 and higher flows of June 2-3, 23, 25-23, 25 and July 1-6, 2009. The peak flow of 2570 cfs occurred at 14:15 on June 27, 2009 at a gage height of 5.47 ft with a shift of +0.19 ft. It exceeded the mean stage of measurement No. 379, made June 25, 2009, by 0.68 ft. in stage.

Discharge.-- Shifting control method was used during all periods of ice-free record. Shift distribution was by time at the start of the water year for transitioning purposes and by stage using shift curve ARKGRNCOVS09 to the end of the water year. Measurements show shifts varying from -0.04 ft. to +0.19 ft. All were given full weight and applied directly, except for Measurement Nos. 375, 376, 380, and 382 which were discounted from -3% to +4% to smooth shifts and shift curve transitions.

Special Computations.-- Discharge for periods of no gage-height record and ice-affected record was estimated on the basis of five measurements, surrounding good record, weather records and by using the final record from Lake Creek below Twin Lakes. Upstream and downstream hydrographs were used in the analyses of the record.

Remarks.-- Record good, except during periods of no gage height record and ice effect, which is estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- The ADCP should be tested at this gage for high water measurements. Levels need to be run in WY2010.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07086000 ARKANSAS RIVER AT GRANITE

RATING TABLE--

ARKGRNCO11A USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

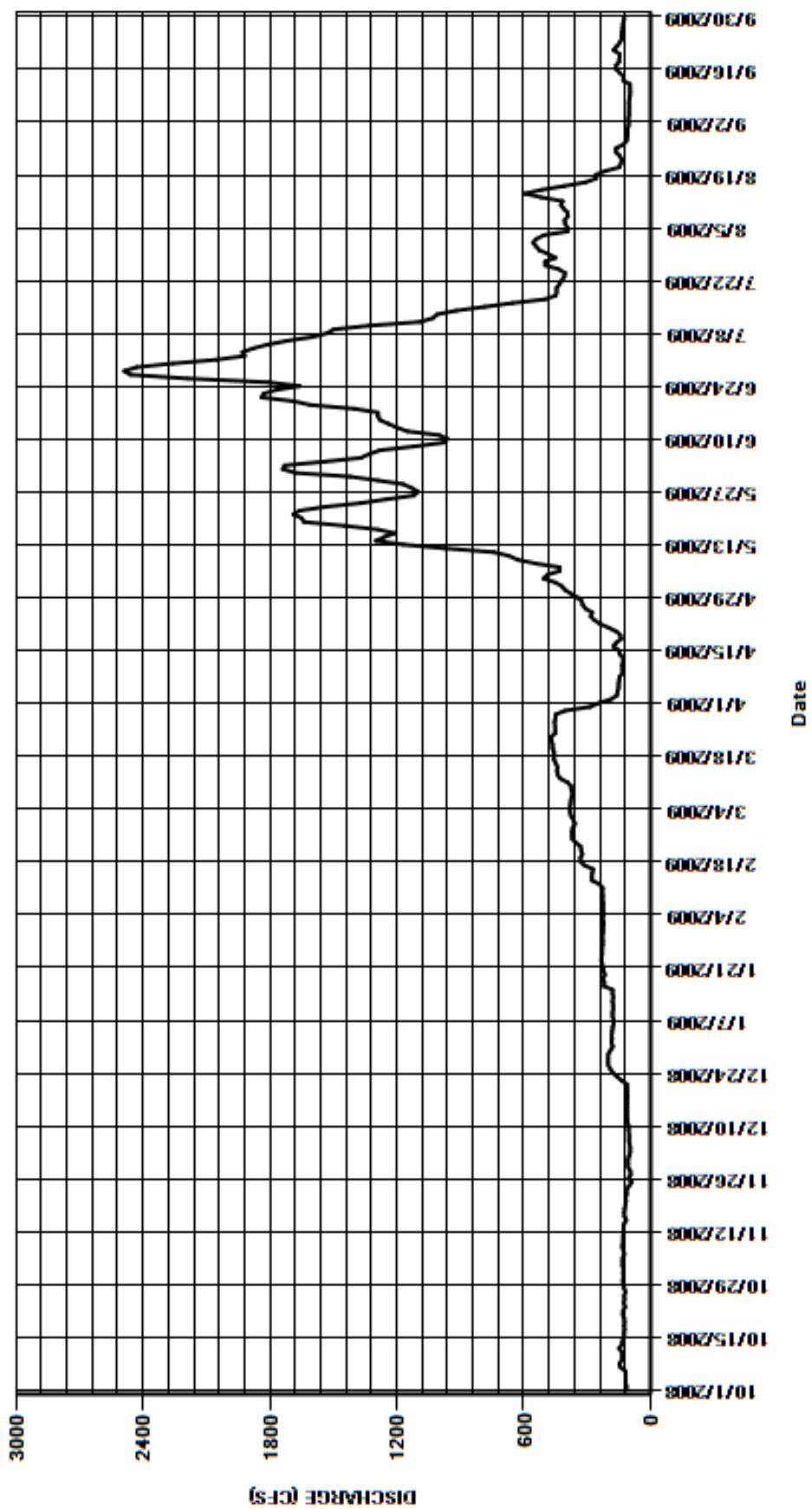
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	114	130	107	185	224	365	246	405	1680	2050	556	105
2	115	129	102	183	222	376	188	420	1740	1920	540	103
3	119	133	97	184	228	381	160	452	1730	1930	505	105
4	119	132	96	182	222	381	157	507	1540	1880	391	102
5	118	132	99	180	225	380	152	488	1370	1810	394	103
6	120	124	103	176	226	378	151	430	1330	1720	405	102
7	143	130	102	175	224	375	150	430	1280	1600	407	103
8	148	134	103	180	228	369	146	545	1120	1530	391	101
9	134	131	104	180	226	375	132	630	980	1500	393	98
10	134	130	105	177	229	376	133	670	961	1330	411	96
11	135	130	110	178	227	393	135	743	1000	1090	425	98
12	150	127	111	180	241	427	130	973	1150	1030	416	98
13	136	129	112	177	277	440	130	1170	1200	1010	517	130
14	133	126	112	180	278	443	146	1300	1240	919	595	127
15	126	115	111	179	276	441	151	1260	1280	787	515	146
16	126	124	111	221	272	448	177	1210	1290	654	410	164
17	124	125	111	219	313	457	162	1290	1290	500	308	163
18	125	123	110	227	332	458	140	1450	1400	449	258	148
19	124	120	111	216	332	457	143	1640	1610	444	259	148
20	125	117	111	223	323	464	162	1650	1690	445	214	147
21	132	118	112	225	329	464	199	1690	1840	431	147	176
22	130	113	138	230	331	469	240	1660	1830	420	141	161
23	121	114	159	234	353	472	266	1540	1770	408	137	146
24	127	104	179	231	371	451	284	1370	1660	405	146	137
25	124	89	190	230	371	452	276	1250	1810	436	165	138
26	125	105	200	230	372	453	308	1120	2190	499	164	135
27	119	95	200	227	368	454	321	1100	2460	499	129	132
28	126	96	200	226	358	451	326	1130	2490	450	114	131
29	129	106	200	229	---	449	347	1170	2430	484	110	126
30	131	106	190	226	---	405	377	1290	2260	527	109	126
31	129	---	179	225	---	287	---	1420	---	541	110	---
TOTAL	3961	3587	4075	6315	7978	12991	6035	32403	47621	29698	9782	3795
MEAN	128	120	131	204	285	419	201	1045	1587	958	316	127
AC-FT	7860	7110	8080	12530	15820	25770	11970	64270	94460	58910	19400	7530
MAX	150	134	200	234	372	472	377	1690	2490	2050	595	176
MIN	114	89	96	175	222	287	130	405	961	405	109	96
CAL YR	2008	TOTAL	196023	MEAN	536	MAX	2590	MIN	89	AC-FT	388800	
WTR YR	2009	TOTAL	168241	MEAN	461	MAX	2490	MIN	89	AC-FT	333700	

MAX DISCH: 2570 CFS AT 14:15 ON Jun. 27,2009 GH 5.47 FT. SHIFT 0.19 FT.

MAX GH: 5.47 FT. AT 14:15 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07086000 ARKANSAS RIVER AT GRANITE
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
Water Year 2009

Location.-- Lat. 39°01'05", Long. 106°16'38", in SE $\frac{1}{4}$ sec. 12, T, 12 S., R. 80 W., Chaffee County, Hydrologic Unit 11020001, on right bank 0.5 mi upstream from water line of Clear Creek Reservoir at elevation 8,875 ft, 1.5 mi downstream from unnamed tributary, and 1.9 mi southwest of Granite.

Drainage and Period of Record.-- 67.1 mi².

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron high data rate SatLink Logger DCP) and shaft encoder in a 42-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder and chart set to inside drop tape gage with adjustable RP on instrument shelf. Control is a concrete dam tapered lower towards the center, located approximately 10 feet downstream. An outside staff gage is used as a supplemental reference gage. However, since its installation, it does not agree with the inside tape, most likely due to draw-down. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods: October 23; November 6-8, 15, 2008, March 24, 27-29, 31, April 2, 5, 6, 7, 2009, when the stage-discharge relationship was affected by ice; and, November 16, 2008 to March 17, 2009, when the station was closed for the winter

Datum Corrections.-- Levels were last run on August 19, 2009. No corrections were needed or made.

Rating.-- The control is a concrete dam tapered towards the center located 10 ft below the gage. Control at high stages includes brush and boulders lining the edges of the channel. It was noticed during inspection that a large chunk of the control, near the middle, was broken off. This has contributed to the higher positive shifts since its occurrence. Rating No. 14, dated 20 February 1996 was used for the entire water year. Twelve discharge measurements (Nos. 88-99) were made during the water year, ranging in discharge from 10.3 to 235 cfs. They cover the range in stage experienced, except for the lower daily flows of February 13-16; March 27-29; April 1-6, 2009, and the higher daily flows of May 15-24; June 18-30, 2009. The peak flow of 492 cfs occurred at 23:45 on May 18, 2009 at a gage height of 4.46 ft and shift of +0.07 ft. It exceeded measurement No. 96, made June 22, 2009, by 0.52 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time and by stage. Shifts were applied by time October 1, 2008 through June 22, 2009. From June 23, 2009 to the end of the water year, shifts were applied using one variable curve (CCACCRCOVS09A). Open water measurements indicated shifts varying from +0.04 to +0.13 ft. All open water measurements were given full weight and applied directly, except for meas. Nos. 94 and 99, which were discounted from +3% to +6% in an effort to smooth shift transitions.

Special Computations.-- Discharge for periods of no gage-height record and ice-affected record was estimated on the basis of eight measurements (Nos. 89-93) and weather records. A hydrograph was used in the analyses of the record.

Remarks.-- Record good, except during periods of no gage height record and ice effect, which is estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- More documentation of weir is needed to keep track of damages and wear that the weir is experiencing. A new rating should be considered but if the weir continues to degrade a new structure may be needed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR

RATING TABLE--

CCACCRCO14 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

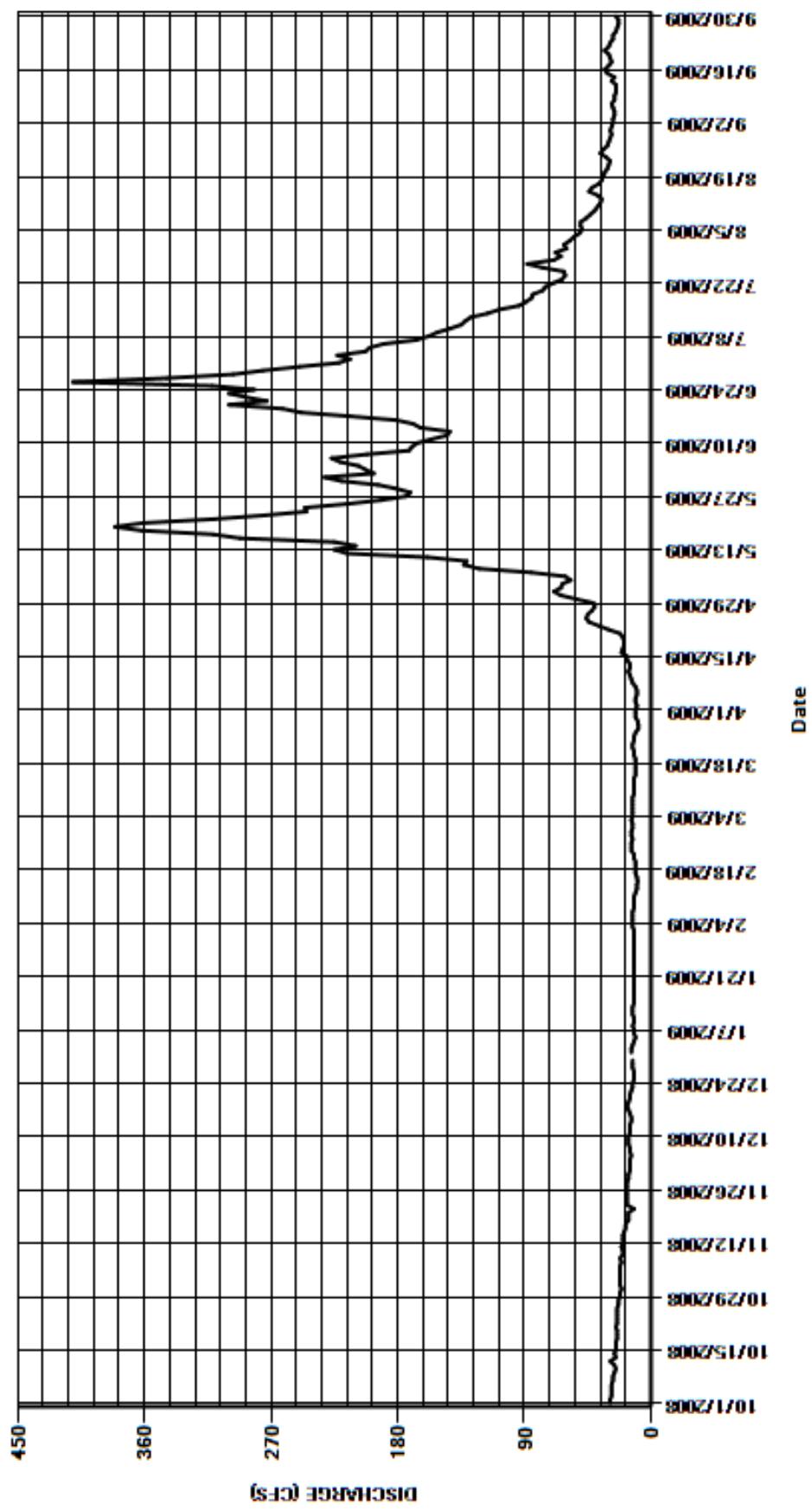
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	22	15	14	12	13	11	64	232	222	62	28
2	29	22	15	14	12	13	10	69	197	214	58	27
3	28	22	15	13	13	14	11	64	203	223	55	27
4	28	22	15	12	13	13	11	63	208	203	51	26
5	28	22	14	11	13	13	10	57	221	200	49	26
6	28	22	15	12	13	13	10	61	227	190	50	27
7	27	21	15	12	13	13	11	85	202	167	50	28
8	27	22	16	13	12	13	13	122	172	158	46	26
9	26	20	16	12	12	13	14	133	170	152	43	26
10	25	20	16	12	12	12	15	131	166	143	40	25
11	26	21	15	13	12	12	16	159	156	135	38	25
12	29	20	15	13	11	12	15	216	145	132	36	25
13	25	20	15	13	10	12	15	225	143	128	35	28
14	26	20	14	12	10	12	17	210	164	116	38	26
15	25	19	14	12	9.5	11	17	225	169	108	44	31
16	25	18	15	12	10	11	21	292	181	94	42	33
17	25	18	16	12	11	11	20	311	214	89	37	30
18	24	16	17	12	11	11	19	362	249	85	35	28
19	24	16	16	12	11	11	19	381	262	84	34	29
20	24	16	15	12	11	12	20	361	300	77	33	30
21	25	12	15	12	12	12	22	311	273	75	31	33
22	24	17	14	12	12	13	30	275	288	69	30	30
23	24	17	13	12	14	13	37	245	300	63	29	29
24	24	17	13	12	14	12	44	246	282	61	32	27
25	24	17	12	12	14	12	46	216	312	62	36	27
26	24	17	12	12	13	11	45	192	411	77	34	25
27	23	17	12	12	14	9	42	174	344	88	31	24
28	23	17	13	12	14	9	40	171	297	69	30	23
29	22	16	13	12	---	9.5	41	181	276	64	29	23
30	22	16	13	12	---	11	53	194	250	68	28	25
31	21	---	---	12	---	11	---	220	---	60	29	---
TOTAL	784	562	434	380	338.5	367.5	695	6016	7014	3676	1215	817
MEAN	25.3	18.7	14.5	12.3	12.1	11.9	23.2	194	234	119	39.2	27.2
AC-FT	1560	1110	861	754	671	729	1380	11930	13910	7290	2410	1620
MAX	29	22	17	14	14	14	53	381	411	223	62	33
MIN	21	12	12	11	9.5	9	10	57	143	60	28	23
CAL YR	2008	TOTAL	31681	MEAN	86.8	MAX	691	MIN	10	AC-FT	62840	
WTR YR	2009	TOTAL	22299.0	MEAN	61.3	MAX	411	MIN	9	AC-FT	44230	

MAX DISCH: 492 CFS AT 23:45 ON May. 18,2009 GH 4.46 FT. SHIFT 0.07 FT.

MAX GH: 4.46 FT. AT 23:45 ON May. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
Water Year 2009

Location.-- Lat. 39°01'20", Long. 106°14'07", Lake County, on left bank 200 ft. upstream from junction Clear Creek and Arkansas River.

Drainage and Period of Record.-- 68.98 sq. mi.

Equipment.-- Sutron Sat-Link 2 data collection platform and stage-discharge recorder (logging shaft encoder) in a wood frame shelter and concrete stilling well. The shaft encoder is set to the inside drop tape gage with adjustable RP on instrument shelf. Outside gage used as supplemental reference. Outside gage tends to read 0.01 ft low.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute data from the stage-discharge recorder log with satellite data used as backup. Record is complete and reliable.

Datum Corrections.-- Levels were last run on July 14, 2006. No corrections were required. Level results in previous years have shown this gage to be very stable.

Rating.-- The control is a 20-ft wide, compound, broad crested weir constructed in 1993. Rating No. 4 was used all year. It is well defined to about 400 cfs. Seven discharge measurements (Nos. 226-232) were made during the year. Measurements range in discharge from 1.23 to 376 cfs. They covered the range in stage experienced, except the lower mean daily flows on April 21-22, 2009, and the higher mean daily flow on May 21, 2009. The peak flow of 390 cfs occurred at 1400 May 21, 2009 at a gage height of 3.26 ft and shift of -0.04 ft. It exceeded the stage of measurement No. 230 made May 21, 2009, by 0.06 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time during the low flow winter period (0100 11/15/2008 to 2355 3/15/2009). Shifts were distributed by stage using two variable stage-shift relationships: CCBCCRCOVSHF08B was continued in use from the end of WY08 and used from 0000 10/1/2008 to 2355 11/15/2008; and, CCBCCRCOVSO9 was defined using Msmts 229-233 and applied from 0000 3/15/2009 to 2355 9/30/2009, a period of variable reservoir releases. Measurements showed shifts ranging from -0.04 ft to 0.18 ft. All measurements were given full weight, except for #226, which was discounted -6% to fit the variable shift relationship CCBCCRVSHF08B. Measurement 232 was not used for the record as it was a test of the ADCP, and resulted in a large negative shift that was inconsistent with shift history at the stage measured. Check measurements will need to be made to test the validity of using an ADCP at this site.

Special Computations.--

Remarks.-- Record is considered good for the entire water year. Larger positive shifts during winter low flow periods are due to weir leakage. Variable stage-shift relations were used only during periods of reservoir releases. This site may be a possible candidate for ADCP measurements in the future, but during low water heavy moss growth occurs and may cause problems for the ADCP. Station maintained and record developed by Cheston Hart.

Recommendations.-- Repair to weir should be attempted as it appears the leaks have increased this water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CLEAR CREEK BELOW CLEAR CREEK RESERVOIR

RATING TABLE--

CCBCCR004 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

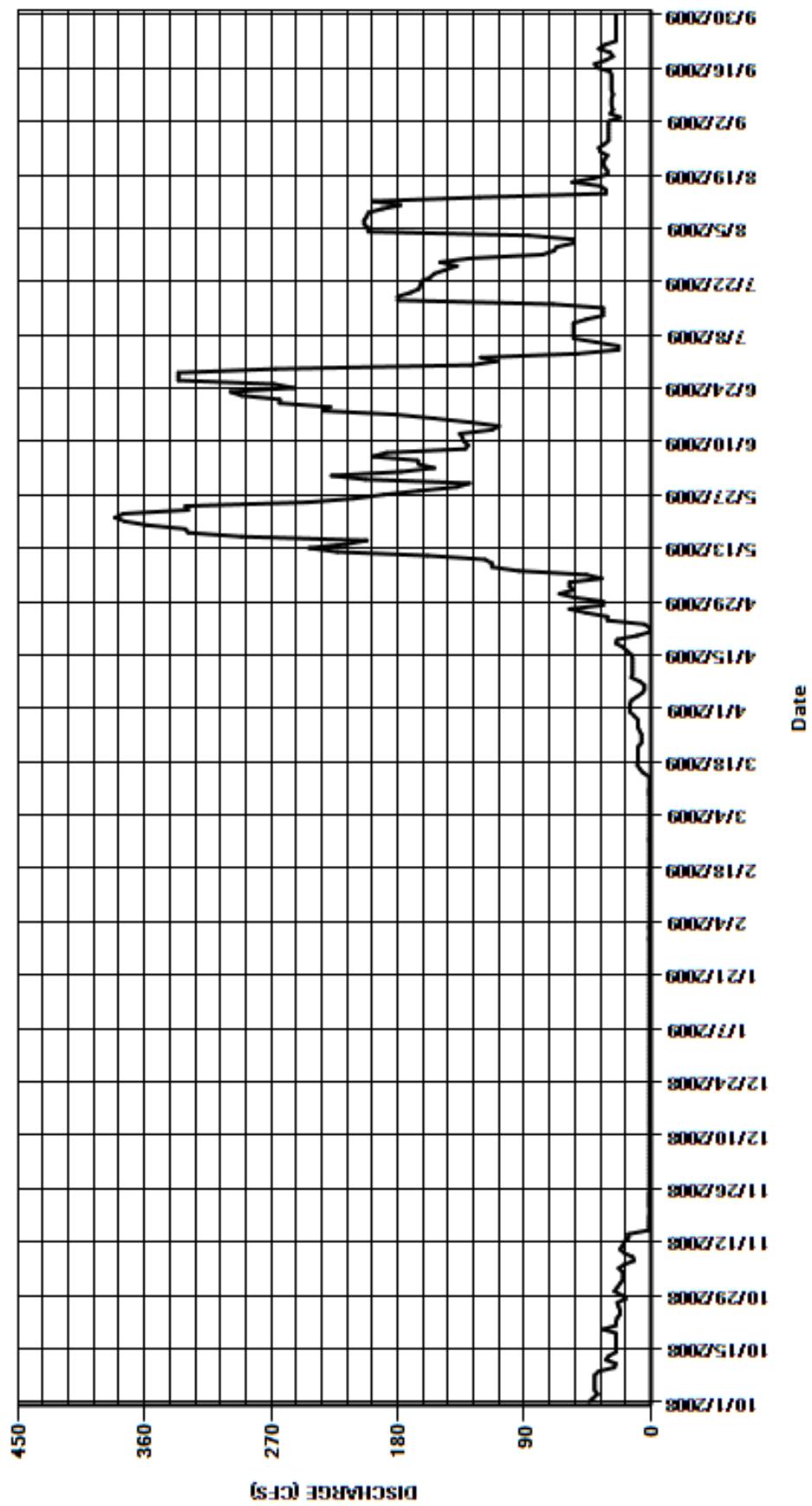
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	22	1.2	1.2	1.2	1.1	15	65	227	110	55	30
2	41	20	1.2	1.3	1.3	1.2	15	55	178	121	55	30
3	38	20	1.2	1.2	1.3	1.2	14	58	154	52	87	22
4	40	20	1.2	1.2	1.2	1.2	10	58	165	23	201	29
5	40	23	1.2	1.2	1.2	1.2	6.1	35	166	23	201	27
6	40	19	1.2	1.2	1.2	1.2	4.5	46	198	39	204	28
7	40	12	1.2	1.2	1.2	1.2	4.5	94	188	55	204	28
8	40	13	1.1	1.2	1.3	1.2	8	113	132	55	202	28
9	37	19	1.1	1.2	1.2	1.3	14	113	130	55	201	27
10	26	22	1.1	1.2	1.2	1.3	13	118	133	55	191	28
11	25	20	1.1	1.2	1.2	1.3	13	159	134	55	178	28
12	32	19	1.1	1.2	1.2	1.2	13	223	136	46	198	28
13	30	16	1.2	1.2	1.2	1.2	13	243	113	34	122	28
14	25	16	1.1	1.2	1.2	1.3	13	217	108	34	32	28
15	25	1.6	1.1	1.2	1.2	5.5	14	202	129	34	32	29
16	25	1.5	1.1	1.2	1.3	7.8	17	291	154	70	36	38
17	25	1.4	1.1	1.2	1.3	9.7	20	329	181	180	56	40
18	25	1.3	1.1	1.2	1.2	9.4	25	331	233	180	41	32
19	25	1.3	1.1	1.2	1.2	9.4	24	358	228	171	31	27
20	34	1.2	1.1	1.2	1.2	9.4	10	374	264	165	31	29
21	25	1.3	1.1	1.2	1.2	9.4	0.66	381	264	164	33	37
22	25	1.3	1.1	1.2	1.1	8.9	0.68	375	291	163	34	33
23	24	1.3	1.1	1.2	1.2	6.6	4.6	329	299	157	33	25
24	22	1.3	1.1	1.2	1.2	6.6	31	331	254	154	31	25
25	22	1.3	1.1	1.2	1.3	6.6	31	244	268	146	36	25
26	23	1.1	1.1	1.2	1.3	8.1	46	211	336	138	37	25
27	24	1.2	1.1	1.2	1.2	9.4	58	190	336	150	33	25
28	18	1.1	1.1	1.2	1.2	9.4	34	165	336	129	30	25
29	21	1.1	1.2	1.2	---	9.4	34	138	267	77	30	25
30	26	1.2	1.2	1.3	---	12	54	129	128	69	30	25
31	24	---	1.2	1.3	---	15	---	203	---	67	30	---
TOTAL	911	281.5	35.2	37.5	34.2	169.7	560.04	6178	6130	2971	2715	854
MEAN	29.4	9.38	1.14	1.21	1.22	5.47	18.7	199	204	95.8	87.6	28.5
AC-FT	1810	558	70	74	68	337	1110	12250	12160	5890	5390	1690
MAX	44	23	1.2	1.3	1.3	15	58	381	336	180	204	40
MIN	18	1.1	1.1	1.2	1.1	1.1	0.66	35	108	23	30	22
CAL YR	2008	TOTAL	25927.85	MEAN	70.8	MAX	374	MIN	0.13	AC-FT	51430	
WTR YR	2009	TOTAL	20877.14	MEAN	57.2	MAX	381	MIN	0.66	AC-FT	41410	

MAX DISCH: 390 CFS AT 14:00 ON May. 21,2009 GH 3.26 FT. SHIFT -0.04 FT.

MAX GH: 3.26 FT. AT 14:00 ON May. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07089250 COTTONWOOD CREEK NEAR BUENA VISTA
Water Year 2009

Location.-- Lat. $38^{\circ}50'04''$, Long. $106^{\circ}07'20''$, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$, sec. 16, T.14 S., R. 78 W., in Chaffee County, on left bank, about 1500 ft. upstream from Arkansas River, and 1200 ft. upstream from bridge at Buena Vista High School.

Drainage and Period of Record.-- 109.24 sq.mi.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink Logger high data rate DCP) and shaft encoder in a 42-inch corrugated metal pipe shelter and well. Shaft encoder and chart set to inside drop tape gage with adjustable RP on instrument shelf. Outside staff gage used for supplemental reference. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for the following periods: Dec. 5, 15, 19, 21, 27, 28, 2008, Jan. 5, 6, 7, 10, 11, 14, 18, 27-31, Feb. 2, 4, 5, 11, 12, 13, 15, 16, 18-21, 28, Mar. 8, 11, 27-29, 31, 2009, when ice affected the stage-discharge relationship.

Datum Corrections.-- Levels were last run on August 19, 2009. The elevation of the RP was found to be within acceptable limits, so no corrections were necessary or made at that time.

Rating.-- The control is a concrete broad-crested, compound weir, with a center V-notch for low flow. Rating No. 4 was used the entire water year, and is well defined to about 676 cfs. Nine discharge measurements (Nos. 727-735) were made during the year. Measurements ranged in discharge from 1.64 to 93.7 cfs. They cover the range in stage experienced except for many lower daily flows and the higher daily flows of May 16-27, 31; June 1-7, 19-29, 2009. The peak of 199 cfs occurred at 2300 on May 18, 2009 at a gage height of 3.38 ft and shift of +0.03 ft. It exceeded the mean stage of measurement No. 734 made June 9, 2009 by 0.55 feet.

Discharge.-- Shifting control method was used for periods of good, ice-free record. Shifts were applied as defined by measurements and distributed by time for the entire water year. Measurements showed shifts ranging from -0.05 to +0.08 feet. All shifts were applied directly and given full weight.

Special Computations.-- Estimation of discharge for periods of ice effect was made using surrounding good record, partial day records, weather records & discharge measurements. A hydrograph was used. It was found that after plotting the hydrograph during the winter period, it appeared that during certain cold periods there was more flow on those days than normal. Knowledge of the physical location, design of the weir and its characteristics during ice periods facilitated obtaining a more realistic flow regime. That is to say, when ice starts to form on the banks of the weir pool, and there is not complete ice cover across the channel, the channel is "necked" down to the point that it is backing the water upstream, causing a rise in gage-height, but in actuality, significantly less flow than indicated.

Remarks.-- Record good, except for periods of ice effect, which is estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- There are many days of no backup record due to a malfunctioning clock and incorrect setup of recorder. It is recommended this be addressed with a possible installation of a CFB to help with plugging of inlets and ice effected days.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07089250 COTTONWOOD CREEK NEAR BUENA VISTA

RATING TABLE--

COCRBVCO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	18	28	24	25	19	20	8.9	103	83	6.5	1.7
2	2.2	18	26	24	23	19	18	12	95	78	3.3	1.8
3	3.6	18	26	25	23	20	17	10	99	81	2.1	1.8
4	5.6	18	24	24	21	19	16	8.2	99	73	2	1.5
5	6	18	23	23	20	19	16	4.5	105	74	2.5	1.4
6	3.7	19	25	24	21	19	16	5.5	119	67	4.3	1.4
7	1.6	25	26	26	21	19	17	18	107	53	4.3	1.6
8	1	31	26	30	22	18	17	37	90	45	3.4	1.5
9	0.67	32	27	27	22	20	17	39	87	39	3.2	1.5
10	0.56	31	27	25	22	20	17	30	78	35	2.6	1.5
11	1.3	31	27	24	20	18	17	39	73	34	2.4	1.4
12	11	30	27	27	19	19	17	69	66	32	2.4	1.4
13	15	31	30	26	19	19	16	81	60	30	2.5	1.6
14	19	30	29	24	22	18	13	76	68	30	2.8	1.4
15	19	26	24	25	19	16	14	84	75	24	3	1.8
16	20	29	33	25	19	15	13	102	79	20	2.7	7.8
17	20	29	33	26	20	17	12	118	84	16	2.3	17
18	18	29	33	24	19	17	10	159	90	14	2.2	11
19	19	29	28	26	19	18	8.6	158	96	11	2.5	13
20	18	28	28	26	18	18	7	146	103	9.1	2.8	11
21	17	27	27	26	18	18	5.6	141	107	7.6	2.2	15
22	12	26	32	25	20	18	4.2	124	101	6	2.1	13
23	17	26	33	24	21	19	4.2	121	100	3.9	2	11
24	23	25	28	23	22	18	3.7	125	98	2	2	11
25	23	25	31	23	21	18	4.8	118	102	2	2.2	11
26	24	26	32	23	20	18	5.6	106	126	6.7	2	9.6
27	23	26	26	21	19	18	5.1	95	123	9.8	1.9	6.7
28	23	27	27	20	17	19	3.8	92	110	4.9	1.8	5.1
29	21	27	30	19	---	18	1.7	86	103	4.4	1.8	3.2
30	18	28	29	20	---	20	3.4	89	90	3.8	1.7	3.2
31	17	---	27	20	---	18	---	99	---	3.9	1.7	---
TOTAL	404.93	783	872	749	572	569	340.7	2401.1	2836	903.1	81.2	171.9
MEAN	13.1	26.1	28.1	24.2	20.4	18.4	11.4	77.5	94.5	29.1	2.62	5.73
AC-FT	803	1550	1730	1490	1130	1130	676	4760	5630	1790	161	341
MAX	24	32	33	30	25	20	20	159	126	83	6.5	17
MIN	0.56	18	23	19	17	15	1.7	4.5	60	2	1.7	1.4

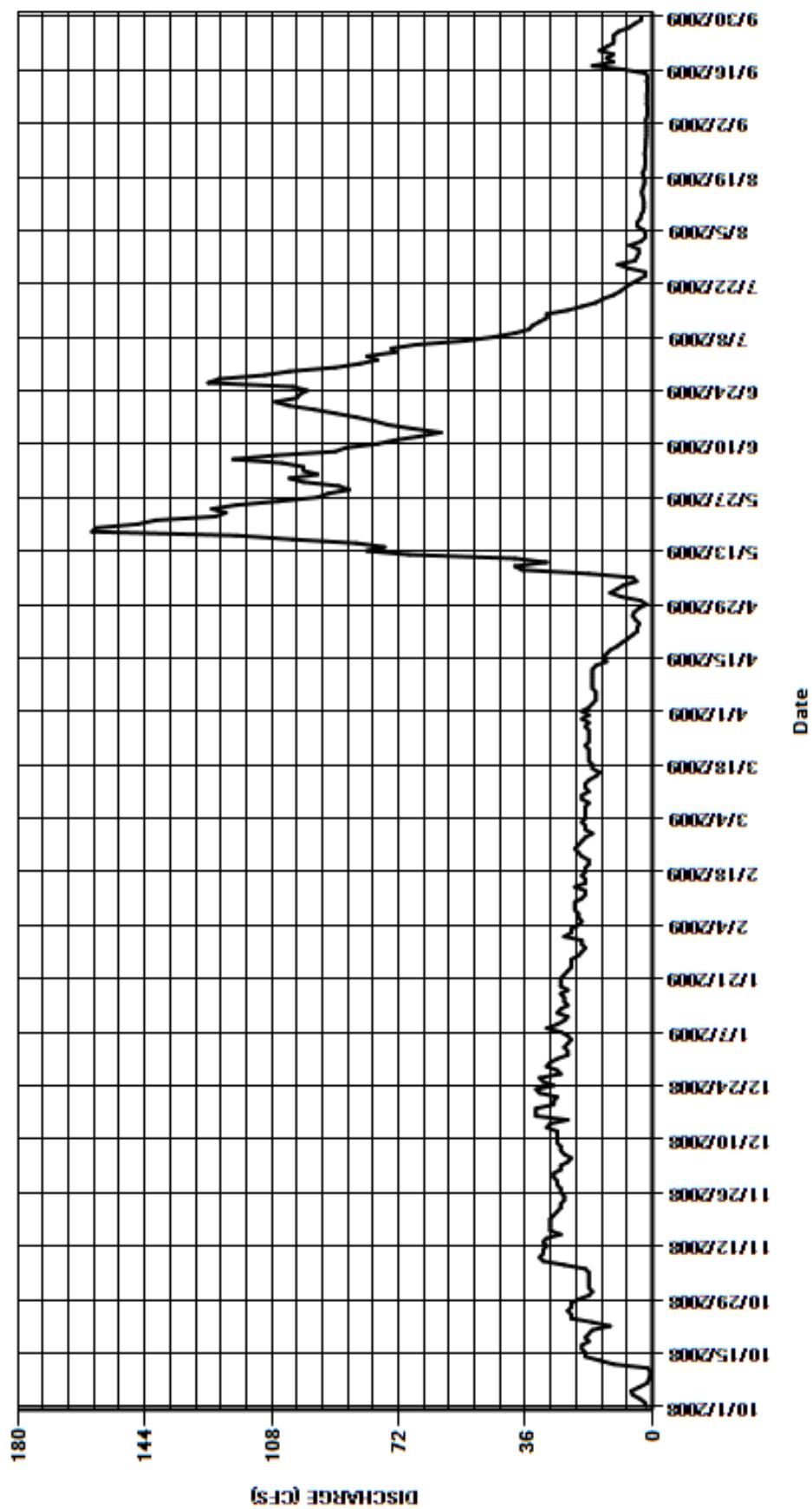
CAL YR	2008	TOTAL	14348.73	MEAN	39.2	MAX	223	MIN	0.56	AC-FT	28460
WTR YR	2009	TOTAL	10683.93	MEAN	29.3	MAX	159	MIN	0.56	AC-FT	21190

MAX DISCH: 199 CFS AT 23:00 ON May. 18,2009 GH 3.38 FT. SHIFT 0.03 FT.

MAX GH: 3.38 FT. AT 23:00 ON May. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07089250 COTTONWOOD CREEK NEAR BUENA VISTA
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07091000 CHALK CREEK AT NATHROP
Water Year 2009

Location.-- Lat. 38°44'30", Long. 106°04'57", in SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, T.15 S., R.78 W., Chaffee County, on left bank, 640' north of the Junction of Co. Hwy. 162 and U.S. 285 on the frontage rd. parallel to U.S. 285, 1/4 mi. south of Nathrop, Co., and 1 mi. west of the confluence of Chalk Creek and the Arkansas River.

Drainage and Period of Record.-- 88.74 sq. mi.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink2 Logger HDR DCP) and shaft encoder in 32-inch diameter corrugated metal pipe (CMP) shelter and well w/ precipitation gage. Shaft encoder and chart set to inside drop tape gage with adjustable RP on instrument shelf. Outside staff gage also used for reference purpose. Control is a concrete dam, tapered lower towards the center, located approximately 5 feet downstream. An oil tube is installed during winter periods to obtain better record during freezing weather conditions. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods: Dec 15, 27-28 2008, when ice affected the stage-discharge relationship. There were also many days that had to be adjusted due to incorrectly setting the shaft encoder gage height to the oil height in the oil tube and not the actual gage height.

Datum Corrections.-- Levels were run on August 18, 2009. Results were well within acceptable limits, so no corrections were needed or taken.

Rating.-- The low concrete dam is the control at all stages, except at higher stages the webbed box culvert (~ 75 ft. downstream) under the highway will sometimes cause backwater and affect the rating. Rating No. 7 (dated Jan. 19, 2006) was used the entire water year, and is well defined to about 1000 cfs. Eight discharge measurements (Nos. 733-740) were made during the year. Measurements ranged in discharge from 16.4 to 236 cfs. They cover the range in flows experienced, except for the lower daily flows during March 20 to April 30, 2009 and the higher flow period of May 12 to June 7, 2009. The peak flow of 452 cfs occurred at 0230 on May 19, 2009 at a gage height of 4.93 ft and shift of +0.14 ft. It exceeded the stage of measurement No. 737 made May 12, 2009, by 0.78 feet.

Discharge.-- Shifting control method was used for periods of good record. Shifts were applied as defined by measurements and were distributed by time for the entire year. Shifts ranged from 0.00 to +0.15 ft. All shifts were given full weight and applied directly except for measurement No. 737, which was discounted by 7% due to its outlier position in the scatter plot.

RECOMENDATIONS—

Special Computations.--

Remarks.-- Record good, except during periods of ice effect, which is estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- Better backup record should be possible with an SDR installed for WY10. There are many missing days in the chart record due to a faulty chart recorder.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07091000 CHALK CREEK AT NATHROP

RATING TABLE--

CHCRNAC07 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

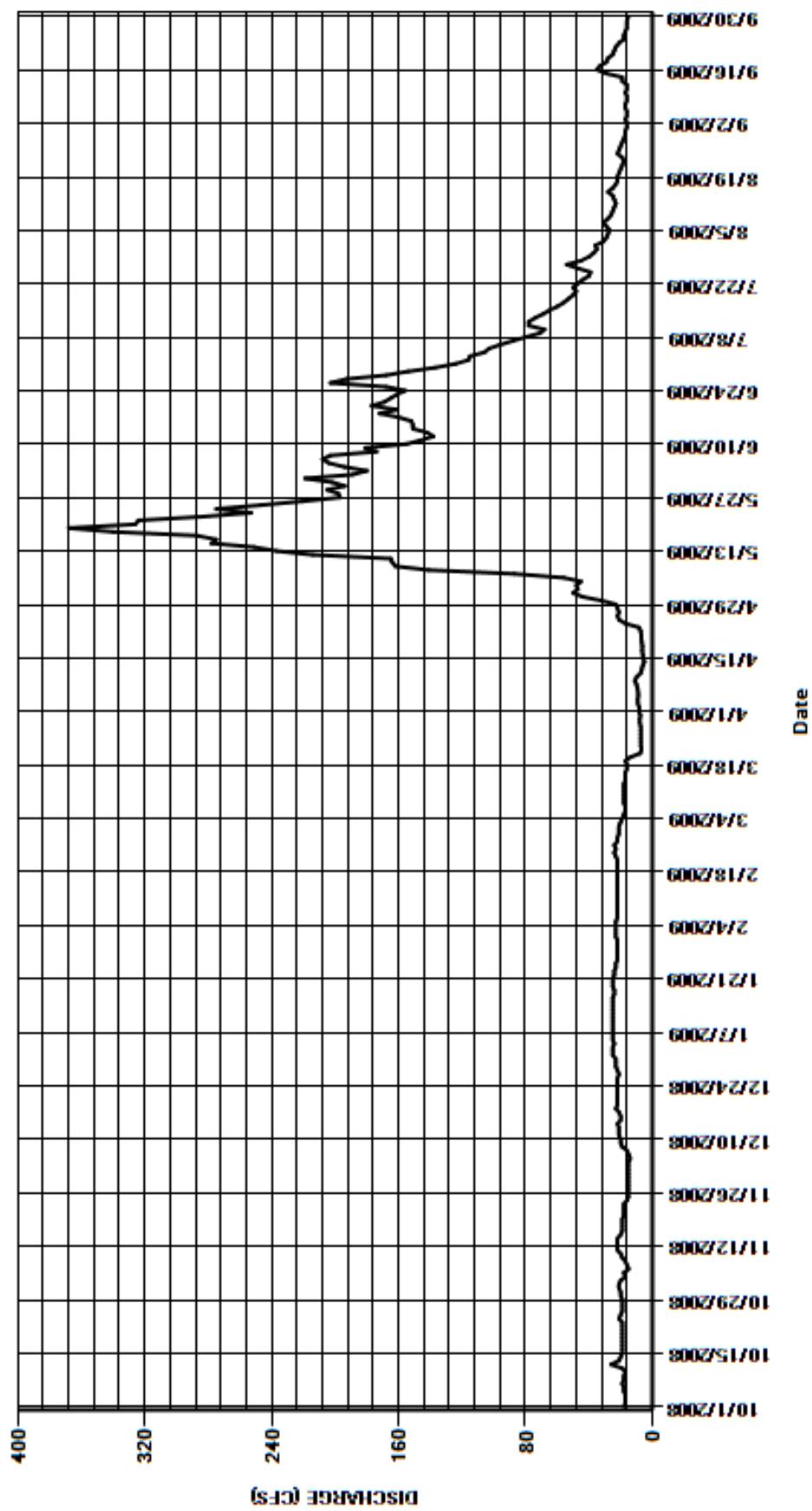
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	21	15	25	23	21	8.4	44	219	124	36	16
2	17	21	15	25	23	21	8.3	50	189	116	31	16
3	17	20	15	25	23	20	9.1	47	180	115	29	17
4	17	17	15	24	23	19	9.2	48	194	106	28	16
5	18	18	14	25	23	18	9	45	204	103	27	16
6	18	15	15	25	22	17	9	56	208	96	29	17
7	19	16	16	25	22	17	9.3	87	203	88	31	17
8	18	17	19	25	22	18	10	141	174	80	28	16
9	18	19	20	25	22	18	11	162	181	71	26	16
10	17	20	20	25	22	18	10	164	155	68	25	17
11	19	22	21	25	22	18	7.4	165	146	78	24	16
12	26	22	21	25	22	18	6.7	214	138	78	23	16
13	21	22	21	25	22	18	6.1	237	142	74	24	19
14	20	22	22	25	22	17	5.1	251	151	69	25	19
15	19	20	20	25	22	17	5.8	278	151	65	28	29
16	19	19	20	25	22	17	6.1	275	152	60	25	35
17	19	19	21	24	22	16	6.5	287	160	56	23	33
18	19	19	23	24	22	16	6.3	340	172	53	22	29
19	19	19	22	25	22	17	6.7	368	161	50	22	28
20	19	18	22	25	22	14	6.9	326	177	48	21	25
21	19	18	22	25	22	7.7	7.1	324	169	50	20	24
22	19	18	22	24	23	6.8	7.3	283	165	47	19	23
23	19	18	22	24	24	7.3	8.6	253	161	44	18	21
24	21	16	22	23	23	7.3	17	275	156	40	19	18
25	20	15	22	23	24	7.4	21	247	168	39	22	18
26	19	15	22	22	22	7.4	22	221	203	47	21	17
27	19	15	21	22	22	7.4	21	197	193	54	20	16
28	19	15	22	22	21	7.4	22	198	168	45	19	16
29	19	15	23	22	---	7.9	23	205	154	40	18	16
30	20	15	23	22	---	7.9	32	194	137	37	17	15
31	20	---	23	22	---	7.6	---	202	---	35	17	---
TOTAL	591	546	621	748	626	437.1	337.9	6184	5131	2076	737	597
MEAN	19.1	18.2	20	24.1	22.4	14.1	11.3	199	171	67	23.8	19.9
AC-FT	1170	1080	1230	1480	1240	867	670	12270	10180	4120	1460	1180
MAX	26	22	23	25	24	21	32	368	219	124	36	35
MIN	17	15	14	22	21	6.8	5.1	44	137	35	17	15
CAL YR	2008	TOTAL	19357.3	MEAN	52.9	MAX	358	MIN	6	AC-FT	38400	
WTR YR	2009	TOTAL	18632.0	MEAN	51	MAX	368	MIN	5.1	AC-FT	36960	

MAX DISCH: 452 CFS AT 02:30 ON May. 19,2009 GH 4.93 FT. SHIFT 0.14 FT.

MAX GH: 4.93 FT. AT 02:30 ON May. 19,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07091000 CHALK CREEK AT NATHROP
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07091500 ARKANSAS RIVER AT SALIDA
Water Year 2009

Location.-- Lat. 38°32'45", Long. 106°00'36", in NE $\frac{1}{4}$ sec. 31, T.50 N., R.9 E., Chaffee County on right bank at Salida, 450 ft. upstream from bridge on State Highway 291, and 2.7 mi. upstream from South Arkansas River.

Drainage and Period of Record.-- 1,218 mi².

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron Model Satlink 2 DCP high data rate transmitter) and shaft encoder in a 4'x 4' steel shelter placed over a CMP stilling well. Shaft encoder and chart set to inside drop tape from an adjustable RP on instrument shelf. Cableway approximately 35 feet downstream from gage. Instrument shelf was replaced on Dec 30, 2008 and new PVC isopar tube was installed on Jan 15, 2009. RP was moved on Jan 15, 2009. A new drop tape was built and put into use on March 10, 2009. No other changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP log data with satellite data and chart record as backup. Record is complete and reliable, except for the following periods: Nov 26; Dec 5, 10, 11, 12 2008, Feb 2; 2009, when gage height was affected by ice on the control; and, Dec 30, 2008-Feb 26, 2009, when gage height record is uncertain due to changes in the instrument shelf, RP elevation, tape length and isopar removal from the well. Several small instrument calibration corrections were made during the water year.

Datum Corrections.-- Levels were run on Jan 15 and Feb 26, 2009. Levels were not run before and after shelf replacement, but a mark was placed on the shelter wall for reference purposes. After shelf replacement the new RP elevation was estimated to be 9.995 ft. Tape length was adjusted to 9.99 ft. The RP was moved on Jan 15, 2009, but positioned over the isopar tube. Levels run on Jan 15, 2009 and again on Feb 26, 2009 established this new RP elevation at 9.955 ft. Tape length was not adjusted on Jan 15, 2009. Therefore a -0.04 ft datum correction was applied to the record and the mean gage heights for Msmts 418 and 419 for the period Jan 15-Feb 26, 2009. The RP was moved again on Feb 26, 2009 to read water surface outside the isopar tube. Levels on that date established the new RP elevation as 9.994 ft. A new tape (length = 9.99 ft) was built and put into use on March 10, 2009. At that date, a correction of -0.15 ft was applied to the shaft encoder and chart due to the new water surface readings. A datum correction of -0.15 ft was applied to the record for the period Feb 26, 2009 (after levels) to March 10, 2009. This correction is attributed to isopar removal from the well and tape length error.

Rating.-- The control consists of a placed boulder riffle about 100 ft downstream of gage. It affects flow over entire range of stage. Heavy brush on both banks also affects flows at high stages. Rating 29, dated Oct 1, 2003, was used from Oct 1, 2008 to 1300 Feb 26, 2009. Rating No. 30, dated August 26, 2009 was developed using Msmts 419 through 427, and applied from 1300 Feb 26, 2009 to the end of the water year. Both ratings are well defined to about 3500 cfs. Eighteen discharge measurements (Nos. 412 to 429), ranging in discharge from 213 to 2630 cfs, were made during the water year. They cover the range in stage experienced, except the lower mean daily flows of Sept 4-12, 2009, and the higher mean daily flows of June 26-30, 2009. The peak discharge of 3230 cfs occurred at 20:00 June 27, 2009 at a gage height of 5.79 ft and shift of 0.01 ft. It exceeded maximum flow measurement No. 423, made May 22, 2009 by 0.52 ft. in stage.

Discharge.-- Shifting control method was used for the entire water year record. Shift distribution was made on a time basis the entire water year. Measurements indicated raw shifts varying from -0.04 to +0.08 ft. All measurements were given full weight and shifts applied directly, except for Meas. Nos. 414-416, 418, and 426, which were discounted from -4% to +3% to smooth shift distribution.

Special Computations.-- Discharge during periods of ice effect was estimated on the basis of good record before and after and partial day record. A hydrograph was used, with comparison made with the downstream gage Arkansas River at Wellsville.

Remarks.-- Record good, except for periods gage height uncertainty due to RP elevation and tape length uncertainty, which are fair, and periods of ice affected record, which are estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- Continued measurements will prove the control has settled and become stable. Attempts to use ADCP from the cableway should be made.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07091500 ARKANSAS RIVER AT SALIDA

RATING TABLE--

ARKSALCO29 USED FROM 01-Oct-2008 TO 26-Feb-2009
ARKSALCO30 USED FROM 26-Feb-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

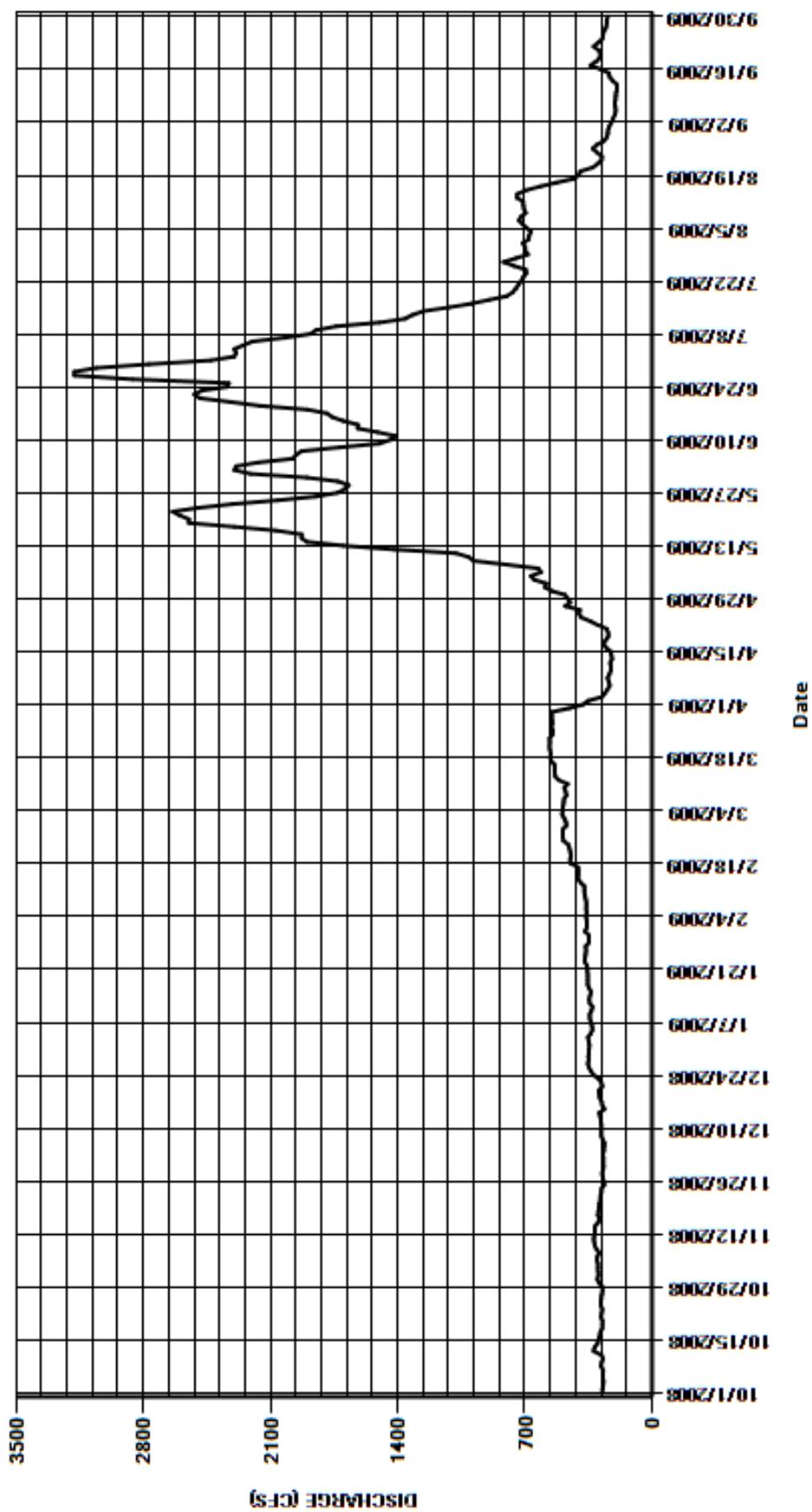
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	272	296	269	345	359	475	379	551	2210	2430	712	234
2	273	297	268	349	360	485	351	590	2300	2300	679	223
3	269	297	271	353	360	496	276	582	2290	2290	677	214
4	268	297	266	337	364	491	259	649	2170	2300	666	204
5	271	303	264	328	360	490	245	667	1980	2250	690	200
6	271	302	262	331	363	487	233	610	1960	2200	713	202
7	269	290	272	337	361	485	238	627	1930	2020	733	206
8	281	307	280	343	363	471	245	802	1720	1880	721	201
9	278	316	279	344	368	476	235	983	1500	1850	696	200
10	270	319	278	334	372	483	227	1010	1440	1740	705	197
11	279	320	280	327	372	464	227	1080	1410	1500	708	192
12	322	315	282	343	374	514	231	1420	1510	1360	710	194
13	317	314	285	346	395	534	220	1700	1620	1320	744	218
14	300	314	291	342	409	535	224	1900	1620	1260	742	234
15	295	297	262	335	406	537	228	1930	1700	1120	693	238
16	288	288	274	347	405	536	252	1930	1760	994	615	284
17	285	298	278	355	408	555	269	2070	1790	897	527	339
18	275	295	288	354	450	561	255	2300	1900	799	433	309
19	274	292	291	354	451	558	241	2550	2160	767	402	287
20	273	290	292	355	447	562	242	2550	2320	750	396	284
21	281	284	274	355	450	565	249	2600	2490	736	327	293
22	278	284	279	359	455	562	297	2640	2520	719	299	322
23	274	279	294	371	462	565	339	2500	2480	709	278	297
24	281	278	322	369	489	549	389	2310	2340	693	277	274
25	281	263	336	366	491	545	402	2060	2330	695	304	270
26	280	268	348	363	490	554	397	1850	2860	761	327	266
27	277	271	353	366	491	549	478	1730	3180	818	305	254
28	272	275	349	348	471	551	451	1690	3180	750	266	250
29	274	269	350	348	---	552	464	1670	3060	683	249	249
30	291	267	347	348	---	553	479	1730	2770	699	244	243
31	301	---	347	370	---	456	---	1900	---	699	242	---
TOTAL	8720	8785	9131	10822	11546	16196	9022	49181	64500	39989	16080	7378
MEAN	281	293	295	349	412	522	301	1586	2150	1290	519	246
AC-FT	17300	17430	18110	21470	22900	32120	17900	97550	127900	79320	31890	14630
MAX	322	320	353	371	491	565	479	2640	3180	2430	744	339
MIN	268	263	262	327	359	456	220	551	1410	683	242	192

CAL YR	2008	TOTAL	294177	MEAN	804	MAX	3660	MIN	262	AC-FT	583500
WTR YR	2009	TOTAL	251350	MEAN	689	MAX	3180	MIN	192	AC-FT	498600

MAX DISCH: 3230 CFS AT 20:00 ON Jun. 27,2009 GH 5.79 FT. SHIFT 0.01 FT.
MAX GH: 5.79 FT. AT 20:00 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07091500 ARKANSAS RIVER AT SALIDA
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07093700 ARKANSAS RIVER NEAR WELLSVILLE
Water Year 2009

Location.-- Lat. $38^{\circ}30'10''$, Long. $105^{\circ}56'21''$, in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, T.49 N., R.9 E., Chaffee County, Hydrologic Unit 11020001, on right bank 50 ft upstream from Chaffee-Fremont County line, 2.0 mi northwest of Wellsville, 2.8 mi downstream from South Arkansas River, and 3.5 mi southeast of Salida.

Drainage and Period of Record.-- 1,485 mi 2 . April 1961 to current year.

Equipment.-- Station is equipped with a satellite-monitored data collection platform (Sutron 8210 DCP) with a Sutron Constant Flow Bubbler (CFB). The CFB is set to an outside horizontal chain weight gage. Cableway located 400 feet downstream from gage. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP log data with satellite data and CFB log data as backup. Record is complete and reliable, except for the following periods: Dec 27-29, 2008, Jan 13, 2009 during which gage height was affected by ice.

Datum Corrections.-- Levels were last run on Sept 12, 2007 using RM #2 as base. The gage was found to be reading within ± 0.02 ft. No corrections made.

Rating.-- Control is a rock riffle about 90 ft downstream. High water control is channel and rock banks. Rating No. 6A, dated Dec. 20, 1993 (extended on Dec. 30, 2002), was used this water year. It is well defined from about 170 to 5500 cfs. Sixteen discharge measurements (Nos. 911-926) were made during the water year ranging in discharge from 268 to 3090 cfs. They cover the range in flows experienced except for the lower daily flows of April 14-15, 2009 and the higher daily flows of May 22; June 26-29, 2009. The peak flow of 3730 cfs occurred at 0930 on June 27, 2009 at a gage height of 6.90 ft and shift of +0.16 ft. It exceeded the mean gage-height of high measurement No. 921, made May 22, 2009, by 0.40 ft. in stage.

Discharge.-- A shifting control method was used. Shifts were distributed by time before and after the peak runoff period. Shifts were distributed by stage using stage-shift relationship ARKWELSHF09 for the period 1221 4/13/2009 to 1345 7/24/2009. Measurements show raw shifts varying from -0.08 to +0.17 ft. All measurements were given full weight, except for measurement nos. 916, 917, 919, and 920 which were discounted from -5% to 5% to smooth shift transitions. Measurement 926 was not used, as it was a test measurement of the ADCP equipment and was made at the Sale Barn bridge upstream of the gage. Further review of the reach between the bridge and the gage shows unmeasured inflows between the gage and place of measurement.

Special Computations.-- A hydrograph was used. For comparison, the station Arkansas River at Salida, located 2.5 miles upstream, was plotted on the same hydrograph. Initially, the record for Arkansas River at Salida is worked, determining flows for ice-affected days there. Then, flows for missing/ice affected/ suspect days at Arkansas River near Wellsville can be estimated from that data, as there is a reasonable correlation that exists between the two stations. There are no known withdrawals from the river between these two stations; only inflows, especially from the South Arkansas River. After preliminary shifting and daily flows are plotted for both, if the Salida flows are greater than the Wellsville flows, then shifts or estimates are adjusted until there is at least some separation between the two, since there is always more flow at Wellsville on a daily basis than at Salida.

Remarks.-- Record good, except for periods of ice affected record, which are estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- The current cableway used for high water measurements needs attention. The rock anchor on the right side is suspect and nearly impossible to evaluate for integrity and the cable should be replaced. Alternative measurement sections including the Sale Barn bridge should be explored.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07093700 ARKANSAS RIVER NEAR WELLSVILLE

RATING TABLE--

ARKWELCO06A USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

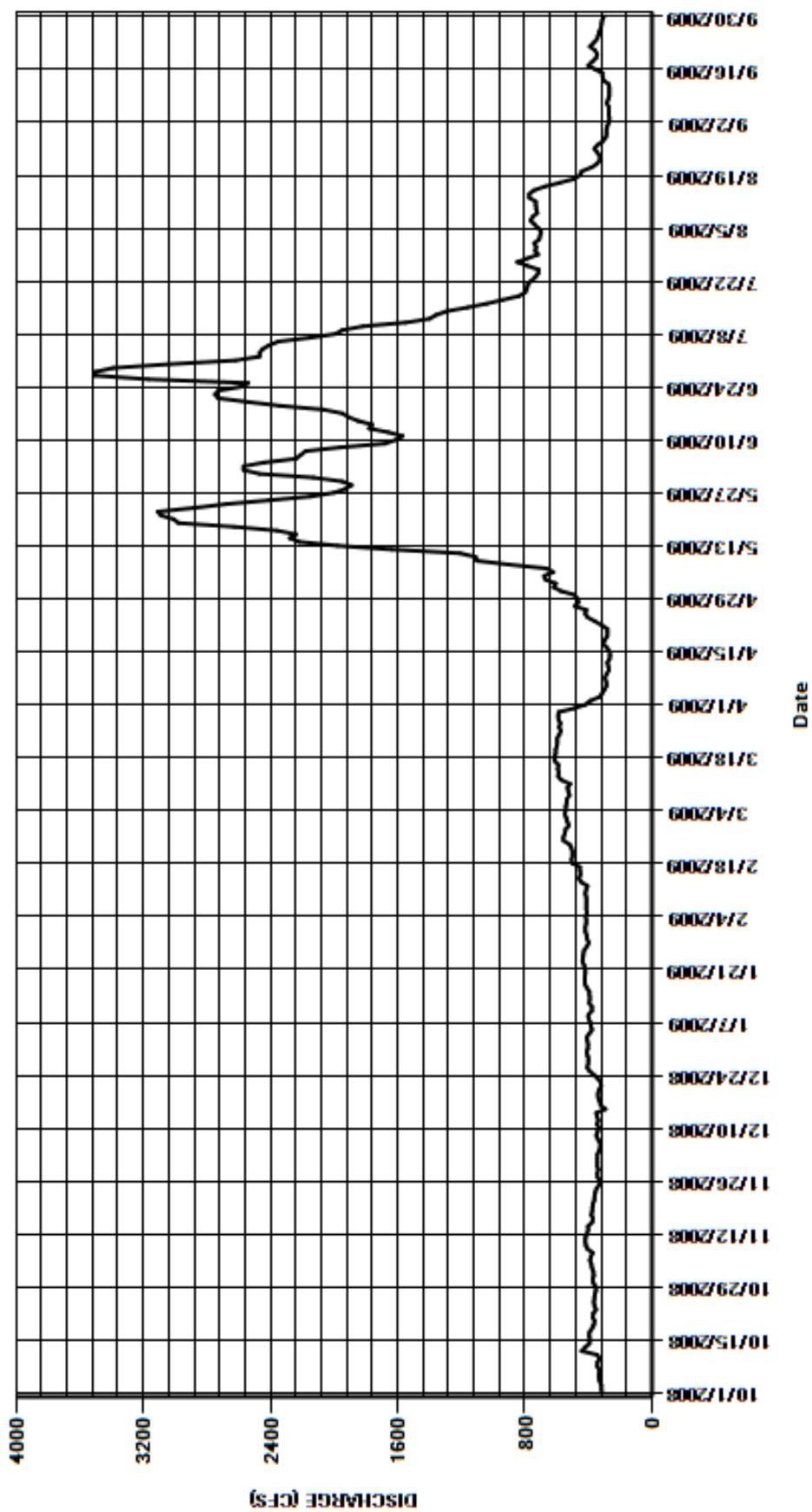
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	316	367	344	402	421	533	417	574	2470	2620	741	281
2	319	369	345	407	415	540	388	619	2570	2470	710	271
3	319	378	344	411	414	549	331	606	2570	2470	705	269
4	329	382	333	394	417	545	313	670	2440	2450	698	271
5	335	391	326	378	410	542	299	680	2240	2410	716	270
6	333	384	327	385	414	538	286	621	2210	2350	741	272
7	330	373	340	389	413	535	289	668	2180	2150	766	285
8	345	406	351	400	412	519	296	898	1960	1990	750	276
9	344	417	343	400	414	527	287	1100	1680	1950	722	269
10	330	420	333	378	420	532	272	1110	1610	1820	729	270
11	345	419	347	377	415	515	274	1210	1570	1550	731	269
12	443	409	338	395	407	570	282	1640	1660	1400	732	271
13	421	402	346	392	445	591	268	1980	1780	1360	772	304
14	394	403	351	393	460	588	264	2220	1760	1290	772	312
15	391	378	293	394	451	593	267	2280	1850	1160	742	313
16	395	371	324	409	453	589	283	2240	1910	1040	673	359
17	394	382	329	422	454	610	309	2360	1950	939	579	402
18	378	377	339	422	502	616	299	2630	2070	837	489	377
19	366	375	340	422	507	607	282	2980	2340	798	452	352
20	362	372	336	421	500	607	280	3010	2540	787	443	345
21	373	362	320	421	500	599	281	3090	2730	783	382	359
22	369	362	322	427	507	596	318	3110	2750	762	346	391
23	352	357	340	438	519	598	359	2880	2730	734	327	367
24	363	350	364	435	557	584	404	2680	2590	717	327	346
25	366	330	392	432	557	573	421	2410	2540	713	345	338
26	363	326	408	428	548	585	413	2150	3170	784	363	331
27	360	343	402	410	544	576	486	2000	3510	848	342	321
28	353	345	400	397	523	589	463	1930	3500	783	308	318
29	354	338	404	409	---	590	470	1890	3390	717	291	314
30	369	346	412	412	---	588	487	1950	3040	735	286	303
31	374	---	404	420	---	488	---	2130	---	729	287	---
TOTAL	11185	11234	10897	12620	12999	17612	10088	56316	71310	42146	17267	9426
MEAN	361	374	352	407	464	568	336	1817	2377	1360	557	314
AC-FT	22190	22280	21610	25030	25780	34930	20010	111700	141400	83600	34250	18700
MAX	443	420	412	438	557	616	487	3110	3510	2620	772	402
MIN	316	326	293	377	407	488	264	574	1570	713	286	269
CAL YR	2008	TOTAL	329828	MEAN	901	MAX	3920	MIN	293	AC-FT	654200	
WTR YR	2009	TOTAL	283100	MEAN	776	MAX	3510	MIN	264	AC-FT	561500	

MAX DISCH: 3730 CFS AT 09:30 ON Jun. 27,2009 GH 6.9 FT. SHIFT 0.16 FT.

MAX GH: 6.9 FT. AT 09:30 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**07093700 ARKANSAS RIVER NEAR WELLSVILLE
WY2009 HYDROGRAPH**



ARKANSAS RIVER BASIN
07095000 GRAPE CREEK NEAR WESTCLIFFE
Water Year 2009

Location.--	Lat. 38°11'10", Long. 105°29'02" (Westcliffe, Colorado quadrangle, 1:24000 scale) in NW¼, NW¼, Section 31, T21S, R72W, Custer County, Hydrologic Unit 11020001, on left bank 0.5 mi upstream from waterline of DeWeese Reservoir at elevation 7690 ft, 0.5 mile downstream from Swift Creek, and 3.6 mile NW of Westcliffe CO.
Drainage and Period of Record.--	320 square miles (furnished by Corps of Engineers)..
Equipment.--	Graphic water stage recorder, shaft encoder, and satellite monitored data collection platform (Sutron Model 8210 DCP with HDR GOES radio) in a 48-inch diameter metal pipe (CMP) shelter and well. Primary reference gage is an electric drop tape inside the well. No outside staff gage. The control is a compound, broad-crested weir located 17 ft. downstream from the gage. An air temperature sensor, installed in radiation shield, and a tipping bucket raingage are also installed at the gage and monitored by the DCP. No changes this water year.
Hydrographic Conditions.--	The gage is located on Grape Creek approximately 3000 ft upstream of the high water line of DeWeese Reservoir. Grape Creek is one of two major creeks draining the Wet Mountain Valley. The gage is located downstream of approximately 15,000 acres of grass hay and pasture fields in the south and central portions of the valley. The gage is at elevation 7690 ft MSL with a drainage area of 320 sq mi consisting of the high mountain valley and west slope of the Sangre de Cristo mountains which rise to elevations of 12,000 ft to over 14,000 ft. Snowpack and snowmelt runoff, and summer thunderstorms dictate the shape and volume of the annual streamflow hydrograph. Peak runoff often occurs in the spring (late March-late May) due to high elevation snowmelt or melt of very wet (and often deep) spring snows in the valley. As a result of irrigation diversions, streamflows at the gage can generally be low during late May to early August, but often flashy peaks during this period are experienced due to intense summer thunderstorms.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the graphic chart record and DCP log data used for backup purposes. Record is complete and reliable, except for the following periods: November 7, 26, 30; December 4-7, 9-13, 15-20, 2008; January 2, 3; March 13-15, 2009, when the stage-discharge relationship was affected by ice on the control. December 21-31, 2008; January 1, 4-31; February 1-16, 2009, when the chart floats were frozen in ice in the well, the well was frozen, intakes were frozen, and the control/weir pool was frozen over. The DCP recorded several values of 0.00 ft gage height on Oct 9, 17, 18, 20, 27, 31, and Nov 6, 2008. Bad values were replaced with backup chart record data without loss of accuracy.
Datum Corrections.--	Levels were last run September 11, 2007 to the electric tape index using RM No. 1 as base. No corrections were necessary as the electric tape index elevation was found to be within allowable tolerances.
Rating.--	The control is a compound, broad-crested weir located 17 feet downstream from the gage. The PZF on the weir is gage height of approximately 0.30 ft. There is an approximately 6-foot wide section where the concrete has broken out on the downstream edge of the weir near the center. At high stages (greater than 3.00 ft gage height), the flow will go overbank on the right side of the weir, and the control includes grass-lined banks and secondary channel on right bank. Rating No. 9, in use since October 6, 2005, was continued in use for all of WY2009. It is well-defined to flows of about 525 cfs, 150% of the historical highest discharge measurement made in WY2007. Eighteen discharge measurements (Nos. 238-254) were made during the year, ranging in discharge from 6.91 to 198 cfs. They cover the range in stage experienced except the lower daily flows of August 17-24, 27-31, Sep 1-4, 8, 10, 12, 2009; and the higher daily flows of April 20, May 27, June 2-6, 26-29, 2009. The peak flow of 373 cfs occurred at 1845 on June 28, 2009 at a gage height of 2.46 ft and shift of -0.04 ft. It exceeded the stage of high flow measurement No. 249, made May 28, 2009, by 0.64 feet.
Discharge.--	Shifting section control method was used for all periods of good record as the range in stage experienced this year was confined to the weir section. Shifts were applied as defined by measurements and were distributed by time with consideration of stage changes from 0000 October 1, 2008 to 1020 March 5, 2009. Shifts were defined by measurement nos. 238-245 during this period. Shifts were distributed by stage from 1100 March 5 to the end of the water year using three variable stage-shift relationships: GRAWESSH09A, which is based on Msmts 245-247, from 1100 March 5 to the local snowmelt peak at 0015 Apr 20, 2009; GRAWESSH09B, which is based on Msmts 247-250, from 0100 Apr 20 to the peak gage height for the water year at 1845 Jun 28, 2009; and, GRAWESSH09C, which is based on Msmts 249, 251-255, from 1900 Jun 28 to the end of the water year. Open water measurements showed raw shifts varying between -0.04 ft and -0.01 ft. All open water measurements were given full weight, except Msmts. 239 and 247, which were discounted 5% and 1%, respectively, to smooth shift distribution.
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of 2 measurements (Nos. 242-243), weather records, and good gage height record before, during, and after ice-affected periods. A hydrograph was used for estimating flows on ice affected days
Remarks.--	Record good, except for periods of ice effect and no gage height record, which are estimated and poor. Station operated and maintained by and record developed by Thomas W. Ley .
Recommendations.--	The concrete weir continues to degrade experiencing spall damage due to ice, and leakage on the right bank. A weir refurbishment project should be planned and implemented.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07095000 GRAPE CREEK NEAR WESTCLIFFE

RATING TABLE--

GRAWESCO09 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

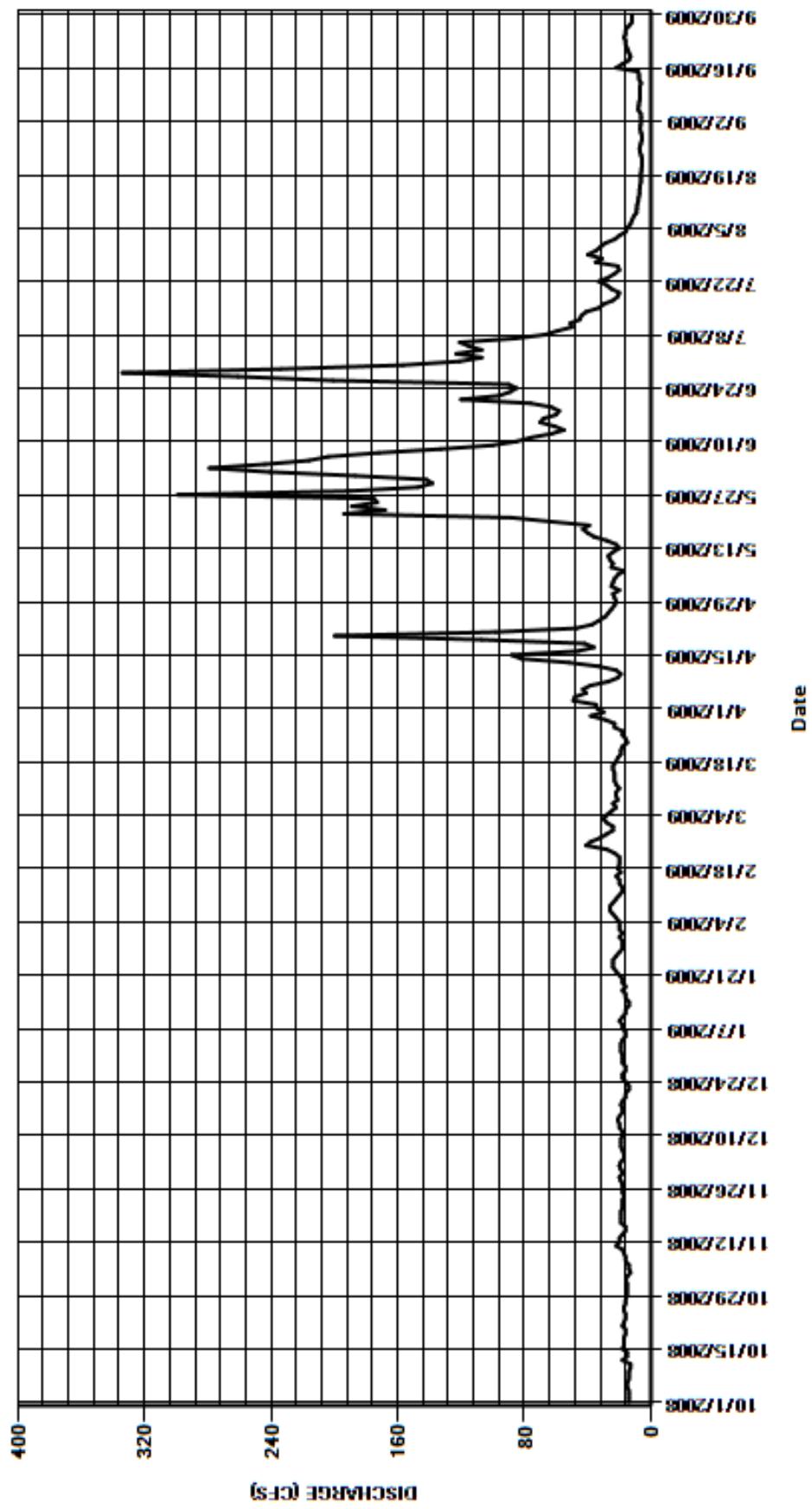
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	15	19	19	18	24	34	24	187	121	29	6.6
2	14	16	20	19	20	28	35	20	241	107	23	6.2
3	14	15	19	19	20	30	49	25	279	123	20	6.2
4	14	13	17	18	20	28	48	24	244	107	16	6.5
5	15	14	17	16	22	25	41	23	216	115	15	8.1
6	15	14	18	16	24	22	43	21	204	121	13	7.8
7	14	16	19	18	26	24	38	17	172	86	12	7.5
8	14	16	19	18	26	21	27	25	133	67	11	6.9
9	14	17	19	20	24	22	21	24	100	59	9.2	7
10	13	18	18	18	22	22	19	26	85	50	9	6.9
11	13	22	18	16	20	20	22	27	76	51	8.8	7
12	18	20	20	16	18	22	33	24	63	45	8.1	6.3
13	15	20	20	14	18	23	52	20	55	44	7.8	7.5
14	15	18	21	14	20	23	82	22	61	41	7.2	7.6
15	18	16	20	16	20	23	88	28	70	33	7.2	8
16	17	16	18	16	22	24	46	36	68	30	7	22
17	17	19	18	18	19	24	36	40	60	24	6.4	18
18	17	19	19	16	21	22	42	43	58	21	6.4	14
19	16	19	18	18	20	21	107	39	63	20	6.5	13
20	16	19	16	18	20	19	200	64	76	25	6.1	14
21	18	18	16	20	20	19	98	88	120	28	5.9	15
22	17	18	14	22	23	18	47	194	96	33	5.8	16
23	16	18	14	24	28	15	37	168	89	27	5.6	16
24	16	17	16	24	41	16	33	189	85	23	6.2	17
25	17	18	18	24	38	18	29	173	90	20	7.1	16
26	17	18	18	22	32	18	27	175	201	21	7.2	16
27	16	18	16	20	28	23	25	299	261	35	6.5	14
28	16	19	16	18	24	23	23	190	334	31	5.9	12
29	15	20	18	18	---	29	22	147	234	40	5.7	12
30	15	18	18	18	---	38	23	138	157	35	6.3	12
31	15	---	18	20	---	30	---	142	---	32	6.9	---
TOTAL	481	524	555	573	654	714	1427	2475	4178	1615	297.8	333.1
MEAN	15.5	17.5	17.9	18.5	23.4	23	47.6	79.8	139	52.1	9.61	11.1
AC-FT	954	1040	1100	1140	1300	1420	2830	4910	8290	3200	591	661
MAX	18	22	21	24	41	38	200	299	334	123	29	22
MIN	13	13	14	14	18	15	19	17	55	20	5.6	6.2
CAL YR	2008	TOTAL	16113	MEAN	44	MAX	244	MIN	12	AC-FT	31960	
WTR YR	2009	TOTAL	13826.9	MEAN	37.9	MAX	334	MIN	5.6	AC-FT	27430	

MAX DISCH: 373 CFS AT 18:45 ON Jun. 28,2009 GH 2.46 FT. SHIFT -0.04 FT.

MAX GH: 2.46 FT. AT 18:45 ON Jun. 28,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07095000 GRAPE CREEK NEAR WESTCLIFFE
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07096000 ARKANSAS RIVER AT CAÑON CITY
Water Year 2009

Location.-- Lat. $38^{\circ}26'02''$, Long. $105^{\circ}15'24''$, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 31, T.18 S., R.70 W., Fremont County, Hydrologic Unit 11020002, on right bank 800 ft upstream from Sand Creek, 0.7 mi downstream from Grape Creek, and 0.7 mi upstream from First Street Bridge in Canon City.

Drainage and Period of Record.-- 3,117 mi 2 . January 1888 to current year. Monthly data only for some periods. Published as near Canyon 1900-1906.

Equipment.-- Graphic water-stage recorder, satellite monitored data collection platform and shaft encoder in 42-in diameter stilling well with a 4-ft x 4-ft steel outhouse-type shelter. Primary reference gage is electric drop tape inside well. Control is a 2-stage concrete diversion dam located approximately 300 ft downstream: first stage whitewater bypass chute on the north side of the river; second stage ogee weir on the south side. Cableway 20 ft downstream from gage. Water temperature and specific conductance monitored by the USGS. Gage rehab work performed in Oct. 2008: streambank stabilized with sheetpile, two new intakes and flush risers/valves installed, new shelter, backup chart recorder replaced with SDR, new appurtenant electronics hardware installed, and new ladder installed inside the stilling well.

Hydrographic Conditions.-- Drainage area ranges from alpine tundra, including Mt. Elbert, Colorado's highest peak (El. 14,433 ft), to sparsely vegetated pinon-juniper vegetation around 5,355 ft elevation. Gage is located downstream of the Royal Gorge, approximately 0.7 miles downstream of Grape Creek. Flow varies seasonally mainly due to snowmelt in the Sawatch Range. Snowmelt generally runs from May through July. Peak flows typically occur during this period. Flows can also be affected by thunderstorm runoff and flash flooding on upstream tributaries during the summer months. Otherwise flows are affected by regulation of upstream reservoirs. Upstream diversions, Hydraulic and South Canon ditches, affect flows and often cause flows at the gage to be lower than those at the upstream Parkdale gage.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite-monitored shaft encoder data, with DCP log and a Stage Discharge Recorder (independent stage sensor and log) as backup. Record is complete and reliable, except for the following periods -Oct. 27-30, 2008: gage was down during rehabilitation work. Oct. 31, 2008 – Sep. 30, 2009: two level runs after Oct. '08 rehab confirmed a difference between outside water surface and the water surface inside the well. Considerable effort was made toward investigating the cause and eliminating the difference without success. Levels show the inside water surface ranging from 0.05 ft to 0.09 ft lower than outside water surface at the particular stages found. The well was leak tested and intakes were flushed. Currently the difference is attributed to negative pressure at the end of the intake caused as relatively high velocity flows pass the intake; however, continued study is needed. Dec. 5, 15-27, 2008; Jan. 15, 26-31; Feb 12-15; and Mar. 27-28, 2009: gage height data affected by ice on the control structure. Dec. 8, 2008: 4 hours of satellite data missing due to antenna problems. Data filled in from DCP log without loss of accuracy. Dec. 19, 2008: 1 hour of bad shaft encoder gage height data due to equipment problems. Data filled in from SDR backup log without loss of accuracy. Sep. 1-2, 2009: 20-hours of bad data on DCP caused by incorrect DCP programming. Data filled in from SDR backup log without loss of accuracy. Primary and backup stage sensor calibration to reference gage supported by 21 visits made this water year. Several small calibration corrections were made to the primary stage sensor during the year.

Datum Corrections.-- Levels ran on Sep. 17, '08 (WY08, before gage rehab), Oct. 30, '08 (after gage rehab), and again on July 28, '09 to check well drawdown and stability of the new RP. Results as follows: Sep. 17, 2008: Levels run from RM 10. Electric tape RP found 18.25 ft; tape length found at 18.26 ft. No correction made. New RMs 14 and 15 established to replace RMs 12 and 13, abandoned the same day. Outside water surface found at 5.34 ft; inside water surface found at 5.35 ft (by electric tape). 2nd stage control surveyed same day: could not survey 1st stage due to depth and velocities thru the chute. Water surface at control found at same elevation as at the gage. Oct. 30, 2008: Levels run from RM 10. New electric tape reference point found at 16.78 ft; tape length adjusted to 16.78 ft. Outside water surface found at 5.46 ft; inside water surface found at 5.41 ft (by electric tape). Capped upstream intake to prevent flow through well. July 28, 2009: Levels run from RM 10. Electric tape RP found at 16.79 ft; tape length found at 16.78 ft. No correction made. Outside water surface found at 6.44 ft; inside water surface found at 6.35 ft (using electric tape and checked with rod and level).

Rating.-- Control is a 2-stage diversion dam for the Canon City Water Works pump station (diversion structure #503) located ~300 ft downstream of the gage. The 1st stage consists of a grouted riprap whitewater bypass chute, approximately 13 ft wide, with sloped sides, and a concrete sill with a point of zero flow at approximately 3.65 ft, gage datum, according to construction plans. Flow through the chute appears to go through critical depth at most stages but could be subject to submergence due to downstream obstructions. The whitewater bypass was cut into the original ogee weir around 1993. The 2nd stage control consists of an ogee weir, 65 ft wide and with a crest elevation of about 4.90 ft gage datum. Boulders were grouted to the downstream face of the weir during the 1993 work. The weir and whitewater bypass have vertical abutments up to a gage height around 12 feet above which the channel banks would become part of the control. Around 14-ft flows would spill into floodplains. During cold periods (typically overnight lows less than 10° F), ice has been observed to form on the 2nd stage weir and surrounding boulders and creates ice-affected backwater conditions at the gage. Canon City Water Works diverts water between the gage and the control structure. Due to channel conditions and location of the cableway, discharge measurements are made upstream of the diversion, thereby introducing error into the stage-discharge relationship. An analysis was made of WY09 pump diversions versus measured shifts; no correlation was found between pump rate and the magnitude of the measured shift. Pumping rates are typically less than 5 percent of river flows and it is assumed that the variation in pump rates is subsumed in other sources of measurement error. The largest source of measurement error is likely due to small scale variations in depth and velocity caused by the cobble channel bottom. Rating No. 23, in use since October 1, 2002, was used all water year. The rating is well-defined by historical measurements to 7000 cfs. Nineteen discharge measurements (Nos. 703-721) were made this water year, ranging in discharge from 171 to 2790 cfs. After the Oct. '08 gage work measurements plotted consistently to the right of the historical stage-discharge relationship, indicating more flow for a given gage height, which is consistent with observed drawdown in the stilling well. WY09 measurements covered the range in stage experienced except for the lower daily flows of Sep. 1-12, 2009, and the higher daily flows of May 20-24, June 3 and 26-30, 2009. The peak instantaneous flow of 3520 cfs occurred at 1615 on June 27, 2009 at a gage height of 8.63 ft and shift of +0.25 ft. It exceeded the stage of measurement No. 714, made June 3, 2009, by 0.62 feet.

Discharge.--

Shifting control method used to compute discharge for the entire water year. Shifts applied as defined by measurements and distributed by time and stage. Shifts were prorated by time from the beginning of the water year to a runoff event at 13:30 Oct. 12, 2008, and again to Oct. 27, 2008, when the gage was taken out of service for rehab work. Since the gage rehab the largest amount of shift variation appears to be explained by changes in gage height. At this point in time, the best explanation is that the stage-shift relationship is caused by drawdown in the well, which would be proportional to the negative of the velocity head, i.e., the larger the velocity, the larger the drawdown and the larger the positive shift. However, based on before- and after-gage rehab pictures of the control taken at the same river stage, it appears that the control approach velocities may be faster and flow less tranquil. Approach conditions could have been affected if disturbed bank and channel material filled in the approach channel. Faster approach velocities could explain positive shifts. Shift curve SC09A, which accounts for the observed stage-shift relationship, was run from Oct 31, 2008, when the gage was brought back on-line, and continued until 20:45 June 3, 2009, when a local runoff peak occurred. Subsequent measurements continued to show a positive trending stage-shift relationship, but with significantly smaller magnitude positive shifts. For this reason, shifts were prorated from shift curve SC09A to SC09B through the recession limb of the local runoff peak from 21:00 June 3 to 02:30 June 12, 2009. Shift curve SC09B was run from 03:00 June 12, 2009, until 13:40 Sep. 17, 2009 (measurement #721) at which time the shifts were prorated by time through the end of the water year in order to allow flexibility in applying WY10 shifts. Note that both shift curves used this water year tie back to the rating around the break between the first and second stage controls (~4.9 ft gage height). Whether positive shifts are caused by well drawdown or by fast approach velocities, or a combination of both, the effect is probably very small when flows are below the 2nd stage weir. At the upper end, both shift curves are "open-ended". As a practical matter the shift curves are applied after-the-fact; the same control and shifts apply up through the peak. Open-water measurements made during WY09 show shifts varying between -0.05 and +0.35 feet. Shifts were applied directly and given full weight except Measurement Nos. 705, 706, 708-713, 717, 718, and 720, which were adjusted from -4% to +5% in order to smooth the shift distribution.

Special Computations.--

Daily average discharges for the missing period during gage rehab were estimated using measurements made immediately before and after gage work and flows at upstream and downstream gages. Daily average discharges during periods of ice-affected gage heights were estimated by correlation with NOAA air temperature data from the Canon City temperature gage (ID 1294). A hydrograph was used to compare daily average flows to those at the Parkdale gage (operated seasonally from April through September by the USGS).

Remarks.--

Record good from beginning of the water year until Oct. 27, 2008; record is poor from Oct. 27 until Oct. 31, 2008, when the gage was down for rehab work; record is fair for the remainder of the water year due to the problem of drawdown in the well, except that the record is poor on days when ice on the control affected the stage-discharge relationship. Gage operated and maintained by and record developed by Mark A. Perry.

Recommendations.--

During WY10 operation of this gage would be improved by installing an outside gage to account for stage-related changes in well drawdown. A solution to the well drawdown problem should continue to be pursued. The whitewater bypass section of the control should be surveyed during any low flow events (less than 200 cfs) in order to verify whether it has changed or differs from the construction plans.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07096000 ARKANSAS RIVER AT CAÑON CITY

RATING TABLE-- ARKCANCO23 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

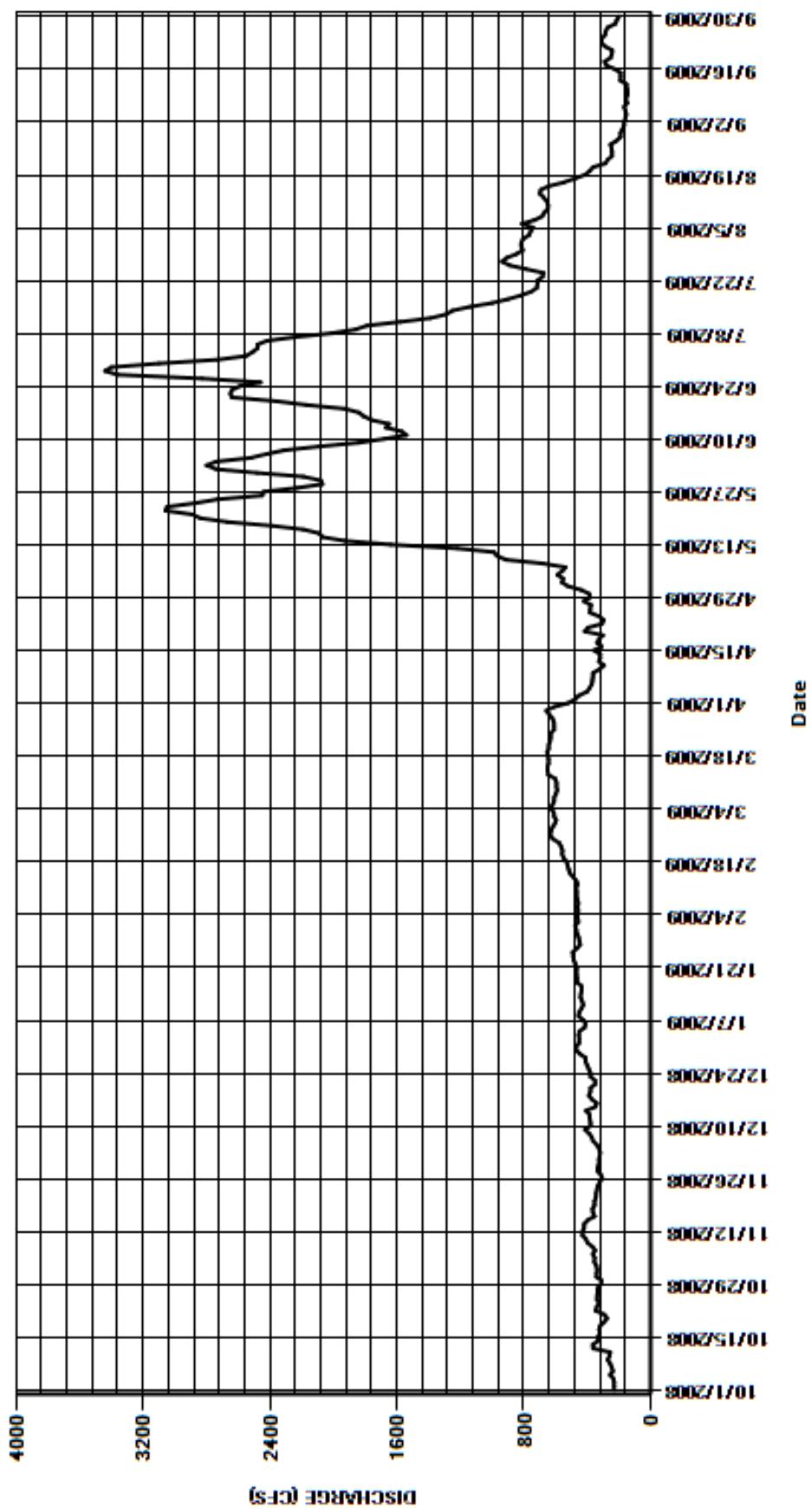
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	229	340	327	450	476	596	521	439	2480	2730	816	168
2	230	338	321	450	456	609	476	523	2740	2550	804	167
3	230	343	319	454	460	611	454	559	2800	2510	767	160
4	235	356	326	450	462	628	402	551	2740	2480	757	153
5	256	352	340	417	458	620	385	589	2520	2480	742	160
6	238	365	364	411	461	609	371	557	2420	2420	811	167
7	245	350	371	424	457	608	367	537	2310	2240	733	148
8	256	368	389	454	463	597	364	681	2090	2010	683	157
9	271	399	414	452	467	590	363	913	1840	1860	670	148
10	260	408	378	438	466	595	321	969	1680	1790	648	144
11	256	431	380	425	471	594	294	987	1540	1580	647	150
12	363	429	384	432	460	602	326	1220	1570	1390	655	152
13	365	420	386	442	470	646	318	1640	1670	1290	675	192
14	331	419	408	440	490	649	319	1930	1650	1250	699	190
15	333	397	350	435	510	651	357	2070	1760	1140	693	189
16	320	354	340	435	517	644	308	2090	1810	1000	641	226
17	325	364	370	465	524	644	338	2190	1840	902	547	280
18	319	366	390	463	530	647	325	2390	1930	820	477	290
19	293	353	380	467	550	653	301	2670	2170	755	413	252
20	275	354	380	469	558	642	416	2840	2360	718	384	245
21	293	346	350	465	556	642	395	2890	2640	715	363	243
22	347	344	350	476	565	634	307	3060	2650	713	286	288
23	340	339	380	486	578	630	296	3050	2640	681	270	310
24	325	334	380	489	617	630	325	2870	2590	676	243	309
25	340	322	390	492	634	608	384	2730	2460	785	244	289
26	337	306	400	465	629	609	381	2450	2830	890	246	283
27	335	314	410	445	621	610	376	2440	3360	937	253	272
28	333	336	410	450	605	620	422	2230	3440	907	216	223
29	313	333	445	455	---	640	382	2070	3400	846	190	214
30	310	326	468	465	---	658	388	2080	3100	806	191	198
31	343	---	470	470	---	608	---	2190	---	816	178	---
TOTAL	9246	10806	11770	14031	14511	19324	10982	54405	71030	42687	15942	6367
MEAN	298	360	380	453	518	623	366	1755	2368	1377	514	212
AC-FT	18340	21430	23350	27830	28780	38330	21780	107900	140900	84670	31620	12630
MAX	365	431	470	492	634	658	521	3060	3440	2730	816	310
MIN	229	306	319	411	456	590	294	439	1540	676	178	144

CAL YR	2008	TOTAL	346444	MEAN	947	MAX	4390	MIN	229	AC-FT	687200
WTR YR	2009	TOTAL	281101	MEAN	770	MAX	3440	MIN	144	AC-FT	557600

MAX DISCH: 3520 CFS AT 16:15 ON Jun. 27,2009 GH 8.63 FT. SHIFT 0.25 FT.
 MAX GH: 8.63 FT. AT 16:15 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07096000 ARKANSAS RIVER AT CANON CITY
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07097000 ARKANSAS RIVER AT PORTLAND
Water Year 2009

Location.-- Lat. $38^{\circ}23'18''$, Long. $105^{\circ}00'56''$, in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, T.19 S., R.68 W., Fremont County, Hydrologic Unit 11020002, on right bank at bridge on State Highway 120 at Portland and 1 mi downstream from Hardscrabble Creek.

Drainage and Period of Record.-- 4,024 mi².

Equipment.-- Shaft encoder and a graphic water-stage recorder in 36-inch diameter CMP shelter and well. Sutron 8210 satellite-monitored data collection platform (DCP) and high data rate transmitter (HDR), a Sutron Constant Flow Bubbler, and other satellite telemetry equipment are installed in a separate shelter higher up on the channel bank. Shaft encoder is hard wired to the DCP. A tipping bucket rain gage is also hardwired to the DCP. Primary reference gage is a drop tape referenced to an adjustable RP mounted on the instrument shelf inside the stilling well shelter. There is no outside reference gage. A cablecar is suspended from a monorail attached to upstream side of Highway 120 Bridge 10-15 feet downstream from gage. USGS Hydrolab monitored by DCP for water temperature and specific conductance.

Hydrographic Conditions.-- Channel bed consists of material from coarse sand to large cobble. The left bank is a steep (almost vertical bank) composed mostly of shale material and vegetation. The right bank consists of a more gradual slope to an elevation of 5 – 6 feet then a "shelf" going into another sloped side all of which is covered with vegetation. The river width is limited to approximately 120 feet by a railroad bridge with concrete abutments about 100 feet upstream of the gage and similarly limited by Highway 120 bridge immediately below the gage.

Gage-Height Record.-- Primary record is hourly averages of 15-minute shaft encoder readings collected and logged by the DCP. The transmitted satellite data, graphic chart record and the Constant Flow Bubbler log were used for backup purposes. Record is complete and reliable except for Dec. 15-18, 20-22, 25-28, 2008, Jan. 5, 6, 13, 26-29, Feb. 11, 12, 14, 15, 17-23, 2009, when ice on the control and in the channel affected the stage-discharge relationship. There were two minor gage height calibration corrections applied to the primary gage-height record. There were also two minor flush correction applied to the primary record.

Datum Corrections.-- Levels were last run on May 6, 2008. No corrections were necessary.

Rating.-- The control at low flow is a downstream rock riffle that consists of gravel to large cobble in the stream channel. At medium to high flows, the riverbank and the highway bridge abutments are part of the control. Rating No.10 dated October 31, 2007 was used the entire water year. During WY2008, measurements before and after the June 2008 high flows showed that these high flows caused substantial channel changes that resulted in larger positive shifts after mid-June 2008 than before. WY2009 measurements show these changes remain in effect. It would appear that the PZF on the low flow control was lowered due to scour during June 2008 high flows. The current estimated PZF of 0.20 ft is uncertain. The low flow control was previously considered to be section control with a backwater pool at the gage, but it appears that high flows during June 2008 lowered the old control section to the point where the low flow control is now the channel at and just downstream of the gage. Seventeen discharge measurements (Nos. 951-967) were made this water year ranging in discharge from 203 to 2900 cfs. They cover the range in stage experienced, except for the lower mean daily flows on Sept. 1-3, and 7-12, 2009; and the higher mean daily flows of May 20-24, June 3 and 26-30, 2009. The peak flow of 3870 cfs occurred at 2045 on July 25, 2009 at a gage height of 5.99 ft and shift of +0.15 ft. The peak exceeded the stage of high flow measurement no. 961 made June 3, 2009 by 0.94 feet.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time from the beginning of the water year through April 14, 2009 at 12:22 hrs based on Measurements 951-958; and again by time from Sept 10, 2009 at 13:00 until the end of the water year based on Measurements 966-968. Two stage-shift relationships were developed and used during the runoff/peak flow period. Shift curve SC09A was used from 13:00 April 14, 2008 until a local peak that occurred at 02:45 June 4, 2009. It is based on Measurements 958-961. Shift curve, SC09B was used from 0300 June 4, 2009 until 12:50 Sept 10, 2009. It is based on Measurements 960-966. Raw shifts varied from -0.02 ft to +0.20 ft. with all measurements made in open channel conditions except for measurement no. 954, which was made during a period when ice affected the control. All measurements were given full weight and applied directly for record purposes with the exception of numbers 960 and 964, which were discounted -1% and -3% respectively to smooth shift distributions; and measurement no. 954, which was not used due to ice effect.

Special Computations.-- Estimates during ice periods were based on measurements, surrounding good record and on air temperature record from the Canon City NOAA weather station located approximately 12 miles east of the gage. The record is also affected by Minnequa Canal sluicing operations which occur upstream of the gage approximately 8.75 miles and at irregular intervals throughout the water year. This operation causes the gage height to increase then decrease rapidly over a short period of time before returning to pre-operation levels and is essentially smoothed in the record by the computation of the daily average of unit data. A hydrograph was used to compare with upstream gage Arkansas River at Canon City.

Remarks.-- Record is considered good, except during periods of ice effect which are estimated and poor. Station operated and maintained by Div 2 staff and record developed by Thomas W. Ley.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07097000 ARKANSAS RIVER AT PORTLAND

RATING TABLE-- ARKPORCO10 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

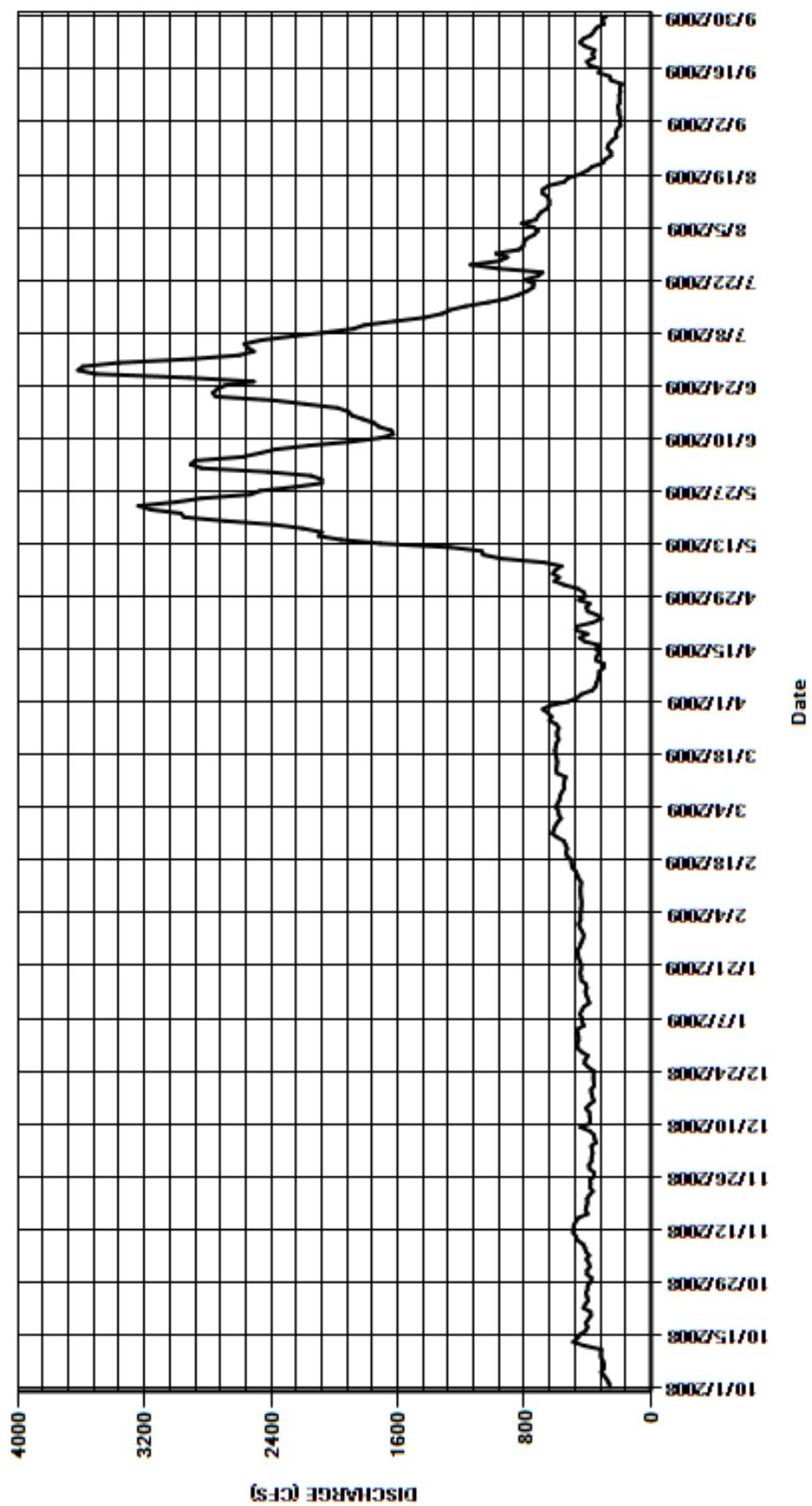
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	260	405	375	458	457	569	525	460	2420	2900	804	192
2	265	386	369	458	445	583	466	548	2840	2600	784	198
3	278	394	372	463	447	585	439	610	2910	2510	738	191
4	295	408	377	468	445	602	371	581	2880	2550	715	203
5	315	391	347	424	441	590	351	620	2580	2570	743	203
6	298	411	357	434	440	577	344	603	2470	2460	817	210
7	295	418	361	435	439	575	335	565	2370	2270	726	198
8	304	430	386	450	443	564	329	681	2160	2060	714	198
9	316	465	445	438	445	547	328	947	1900	1880	694	201
10	317	474	387	424	447	552	300	1060	1710	1810	655	193
11	313	492	385	389	444	547	296	1070	1630	1620	643	198
12	420	489	388	399	440	539	348	1270	1640	1430	642	184
13	492	488	390	408	456	594	344	1710	1720	1320	652	253
14	466	475	411	415	466	599	323	1960	1750	1270	686	260
15	447	458	390	407	476	596	348	2100	1820	1170	684	331
16	412	400	360	411	498	592	327	2080	1890	1030	647	317
17	400	413	370	440	502	597	419	2200	1910	914	548	390
18	413	408	376	442	504	601	451	2380	1980	840	526	404
19	397	401	379	447	531	607	401	2690	2180	784	451	360
20	380	404	360	442	536	602	476	2950	2380	745	403	370
21	381	390	362	440	530	597	470	2970	2750	740	373	355
22	427	367	364	447	540	583	370	3160	2770	801	304	416
23	415	385	363	458	550	594	315	3240	2740	715	291	450
24	397	382	363	461	593	593	340	3000	2690	685	252	428
25	404	385	398	466	624	582	400	2840	2510	967	253	378
26	411	359	420	448	614	598	409	2530	2920	1140	275	360
27	401	360	416	442	605	642	387	2470	3510	958	268	342
28	400	389	398	430	590	628	455	2250	3620	909	246	296
29	380	392	438	424	---	651	416	2080	3590	980	218	312
30	375	376	462	435	---	684	423	2080	3360	835	222	282
31	406	---	468	449	---	637	---	2150	---	807	213	---
TOTAL	11480	12395	12037	13552	13948	18407	11506	55855	73600	44270	16187	8673
MEAN	370	413	388	437	498	594	384	1802	2453	1428	522	289
AC-FT	22770	24590	23880	26880	27670	36510	22820	110800	146000	87810	32110	17200
MAX	492	492	468	468	624	684	525	3240	3620	2900	817	450
MIN	260	359	347	389	439	539	296	460	1630	685	213	184
CAL YR	2008	TOTAL	352415	MEAN	963	MAX	4120	MIN	260	AC-FT	699000	
WTR YR	2009	TOTAL	291910	MEAN	800	MAX	3620	MIN	184	AC-FT	579000	

MAX DISCH: 3870 CFS AT 20:45 ON Jul. 25,2009 GH 5.99 FT. SHIFT 0.15 FT.

MAX GH: 5.99 FT. AT 20:45 ON Jul. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07097000 ARKANSAS RIVER AT PORTLAND
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07099400 ARKANSAS RIVER ABOVE PUEBLO
Water Year 2009

Location.--	Lat. 38°16'18", Long. 104°43'03", in SE 1/4 NE 1/4 sec. 36, T.20 S., R.66 W., Pueblo County, Hydrologic Unit 11020002, on left bank of Arkansas River, 100' downstream from NE corner of Arkansas River bridge, approx. 0.25 mi. downstream from Pueblo Dam, and 7 mi. West of Pueblo.
Drainage and Period of Record.--	4,670 mi ² . October 1965 to current year. Periodic water quality and sediment data available Oct. 1965 to current year.
Equipment.--	Satellite-monitored data collection platform (high data rate Sutron 8210 DCP), Sutron Accububble, shaft encoder, and graphic chart recorder in a 4 ft x 4 ft concrete block shelter over a CMP stilling well. At low flows, gage heights of approximately 1.80 feet and below, the well becomes isolated from the river, and the primary reference gage is an outside staff on the left bank just below the shelter. The outside staff is used up to a maximum gage height of 2.69 feet, above which the staff becomes submerged. When the well has contact to the river (gage heights greater than 1.80 feet), an electric drop tape referenced to a fixed index mounted on the instrument shelf inside the shelter is used as the primary reference gage. A cableway is used for high flow measurement approximately 10 feet upstream from gage. USGS Hydrolab measuring water temperature and specific conductance is co-located at the gage and monitored by the DCP. Accububble was replaced with a Sutron Constant Flow Bubbler (CFB) on December 12, 2008. No other equipment changes made this water year.
Hydrographic Conditions.--	The gage is located approximately a quarter mile downstream of the Pueblo Reservoir Dam at an elevation of 4740 ft above MSL. The riverbed mainly consists of gravel and cobble to large rocks 24+ inches. The riverbed is continuing to stabilize after channel work and rock jetty placement done December 2004 – May 2005. The channel is subject to moss growth from October to May of various types due to the cold and low flows. Because of channel work that was done measurements in the discharge range from about 650 to 800 cfs are of poor quality as the gage height is too deep to wade and too shallow for a good cable measurement.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data. The graphic chart recorder is used for backup purposes when the well is not isolated, at gage-heights above 1.80 feet. For the periods: October 1 – 7, October 9, 2008 through March 19, 2009, when gage heights were less than 2.50 ft, primary data were from the Accububble and CFB. For the periods: October 8 and 9 (due to a DCP programming error), March 13 during a test release by the Bureau of Reclamation ,and, March 19 - September 30, 2009 when gage heights were greater than 2.50 ft, the shaft encoder was used for primary record. The "bubbler" were not used during high water, due to a problem with tracking stage changes accurately. This is probably due to the position of the end of the orifice line, which will be repositioned in water year 2010. Record is complete and reliable for entire water year, except the period from mid October to late December when moss growth in the channel can cause a backwater effect.
Datum Corrections.--	No levels were run this water year. Levels were last run September 17 and September 18, 2008 (as a check of the staff gage). The staff gage was found to be 0.03 feet high; this was absorbed in the shift during periods of AccuBubble and CFB usage.
Rating.--	The control at low flow is a series of rock riffles above and below the gage, and large rocks, which were placed in the riverbed by the USACE from December 9, 2004 to May 19, 2005. The large rocks (36 inch plus) were placed in clusters, starting at about 100 feet below the gage house at various points crossing the river, while the "riffles" which start about 150 feet below the gage house consist of 24 to 36 inch rock placed in a series of jetties extending from the left bank angling upstream at lengths from 30% to 50 % across the river. The control at medium and high flows is the riverbed (gravel to large cobble) along with the large rock placements and banks (grass and brush). Due to the USACE work in the channel, negative shifts continue to be observed this water year as have been since water year 2005, along with an increased amount of moss in the channel. Moss was not noted as often as in past years. Rating No. 18 was developed from WY 08 measurements, which had large negative shifts. It was implemented October 1, 2008 and used the entire water year. The rating is well defined to 6000 cfs. Twenty-two discharge measurements (Nos. 1148 – 1169) were made this water year, ranging in discharge from 52.8 cfs to 2930 cfs. They cover the range in stage experienced, except for the lower daily flows of December 9, 10, 2008 and higher daily flows of May 21 – 24, 2009. The peak flow of 3170 cfs occurred at 1600 on May 23, 2009 at a gage height of 6.13 ft and a shift of 0.00 ft. It exceeded measurement No.1163 made June 29, 2009 by 0.13 feet in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements, and distributed by time with considerations of stage changes for the period: October 1, 2008 at 0000 to 0841 March 19, 2009 and from 1400 September 22 to 2359 September 30. Two variable shift curves were used, ARKPUECOSC01 from 1400 March 19 to 1600 May 23 and ARKPUECOSC02 from 1600 May 23 to 1345 September 22. Shifts varied from -0.13 to +0.03 ft., with all measurements made in open channel. All shifts were given full weight with the exception of measurement Nos. 1154, 1162, 1165, and 1166, which were discounted, from -5 to +3 percent for smoothing purposes. Measurement 1167 was not used due to a large negative shift, which was not verified.
Special Computations.--	A hydrograph was used.
Remarks.--	Due to the number of instruments used for record collection, including the reservoir release records and number of measurements during gage height changes, this record is rated good, except for periods of moss, which should be considered fair to poor. This gage is immediately below the Pueblo Reservoir and does not experience ice effects. The number of measurements made is determined by the numerous "gate" changes. These changes result in the streambed changing, which are a result of the heavy equipment work done in the channel, as well as "washing" out moss. The channel still has not completely stabilized. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07099400 ARKANSAS RIVER ABOVE PUEBLO

RATING TABLE-- ARKPUECO18 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

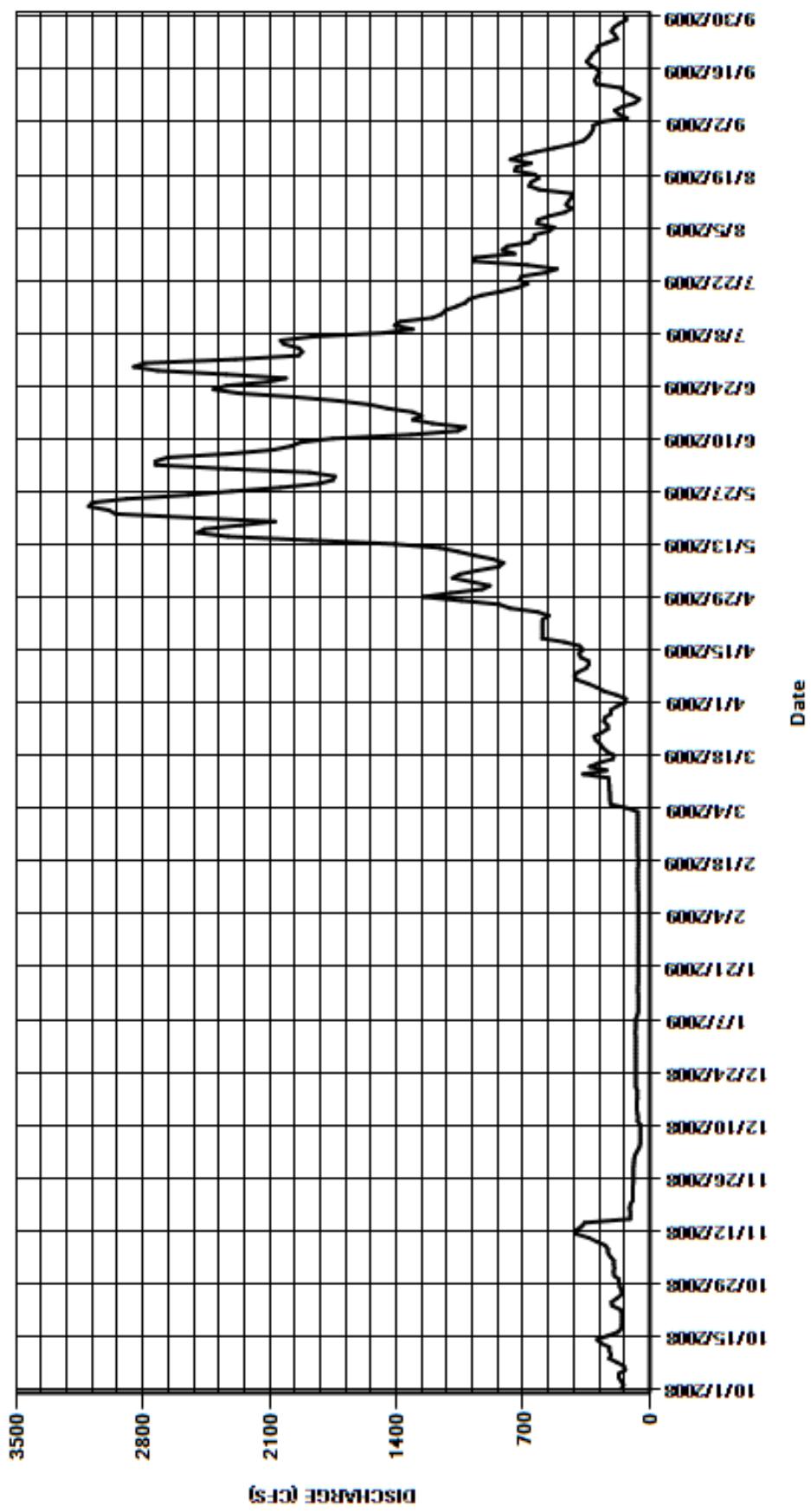
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	158	201	87	77	63	67	137	927	1880	2290	667	313
2	145	196	81	78	63	67	133	884	2340	1940	638	265
3	159	200	70	79	63	67	185	984	2730	1920	638	125
4	172	199	58	79	63	127	254	1090	2730	1940	556	170
5	172	218	53	78	63	217	293	1050	2660	2020	528	194
6	136	231	53	78	64	220	342	951	2310	2040	622	150
7	144	231	53	78	64	220	403	835	2080	1870	617	82
8	181	246	53	69	64	221	417	808	1980	1470	556	57
9	224	293	52	64	63	224	399	867	1930	1310	469	96
10	214	336	52	64	65	224	354	969	1750	1410	431	145
11	223	404	68	64	65	227	338	1060	1320	1380	463	158
12	223	410	65	64	66	229	339	1160	1060	1200	449	294
13	268	377	69	64	66	369	383	1410	1020	1150	432	304
14	291	361	72	65	66	238	391	1870	1200	1130	431	293
15	234	109	73	65	66	331	371	2330	1310	1070	611	279
16	177	109	73	65	66	280	388	2500	1260	1020	667	292
17	158	109	69	64	64	204	470	2460	1310	998	656	328
18	155	111	70	64	64	199	595	2260	1450	929	616	350
19	154	107	69	64	65	238	593	2070	1550	821	633	331
20	154	93	77	65	65	259	593	2520	1720	734	745	318
21	154	93	77	64	65	275	594	2950	1960	676	738	288
22	163	94	77	64	65	298	593	2990	2270	720	657	288
23	208	93	77	65	67	307	593	3100	2410	709	770	235
24	212	93	77	64	67	266	557	3080	2340	575	719	180
25	181	90	77	64	67	231	620	2890	2110	513	629	192
26	155	90	77	65	67	233	773	2550	2010	677	529	212
27	156	90	77	64	67	254	831	2310	2340	973	434	200
28	166	90	78	63	67	248	1040	2040	2720	964	366	171
29	170	90	78	63	---	215	1250	1830	2850	747	342	131
30	171	88	78	63	---	215	1100	1750	2790	814	325	129
31	197	---	78	63	---	183	---	1740	---	788	313	---
TOTAL	5675	5452	2168	2090	1820	6953	15329	56235	59390	36798	17247	6570
MEAN	183	182	69.9	67.4	65	224	511	1814	1980	1187	556	219
AC-FT	11260	10810	4300	4150	3610	13790	30410	111500	117800	72990	34210	13030
MAX	291	410	87	79	67	369	1250	3100	2850	2290	770	350
MIN	136	88	52	63	63	67	133	808	1020	513	313	57
CAL YR	2008	TOTAL	276556	MEAN	756	MAX	3930	MIN	52	AC-FT	548500	
WTR YR	2009	TOTAL	215727	MEAN	591	MAX	3100	MIN	52	AC-FT	427900	

MAX DISCH: 3170 CFS AT 16:00 ON May. 23,2009 GH 6.13 FT. SHIFT 0 FT.

MAX GH: 6.13 FT. AT 16:00 ON May. 23,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07099400 ARKANSAS RIVER ABOVE PUEBLO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO
Water Year 2009

Location.--	Lat. 37°43'40", Long. 105°21'03", in sec 5, T.27 S., R.71 W., Huerfano County, on left bank at Manzanares crossing, 500 ft downstream from private bridge, .2 mi downstream from Manzanares Creek, and 3.5 mi southwest of Redwing.
Drainage and Period of Record.--	73 mi ² . Gage established July 1923 by USGS. History of gage prior to April 1946 published in USGS WSP's 1711 and 1731. From April 26, 1946 to September 30, 1972 gage was operated at datum 1.00 ft higher. Monthly discharge only for some periods of record. Gage discontinued from June through September 1977. Gage re-established October 6, 1977 at same location and datum.
Equipment.--	Sutron model 8210 High Data Rate (HDR) satellite-monitored data collection platform (DCP) with shaft encoder and graphic water-stage recorder, inside a 48-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder and chart set to inside electric tape gage. A new rock weir control was constructed in the channel approximately 15 ft below the gage in May 2009. No changes this water year.
Hydrographic Conditions.--	The gage is set in a narrow reach of the Upper Huerfano Valley at an elevation of 8190 feet MSL. Above the gage is a combination of mountainous and high alpine terrain which is subject to flash flooding. Below the gage are several agricultural diversions, which are in a wide valley.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. It is complete and reliable, except for the following periods: October 22, 23, November 6 – 9, 15, 16, 20–26, 29, 30, December 1, 3 – 16, 19 – 31, 2008, January 4 – 6, 10 – 21, 26 – 31, February 1 – 22, 27, 28, March 1, 2 – 8 – 17, 24 – 31, April 1 – 7, 13, 17, 18, 2009. when the stage-discharge relationship was affected by ice; May 15, when construction of the rock weir was done. A 0.32 ft flush correction was made June 19. This correction was applied back in time to June 10 and prorated back to June 1, 2009.
Datum Corrections.--	Levels were run May 12, 2009 before the weir construction was done. Last levels were run October 7, 2005. No corrections were needed.
Rating.--	A rock riffle 15 feet below gage was the control at low and medium stages up to about 50 cfs. At higher stages, the banks (left side is a concrete wing wall and right side covered with grass) and downstream channel become part of the control and affect the stage-discharge relationship. This control was used up to May 15 when a boulder weir was constructed to help stabilize the channel and provide a stilling pool for the gage. The rock weir is the current control for stages up to about 90 cfs. At higher stages the banks (left side is a concrete wing wall and right side covered with grass) again become part of the control. Rating No. 24 was used from October 1, 2008 to May 15, 2009. It is defined to a gage height of 3.17 ft and discharge of 208 cfs, approximately twice the historic high discharge measurement. Rating No. 25 was used from May 16 to end of the water year; it was developed from cross sections made May 20, 2009 along with a measurement of 93.6 cfs at gage-height of 3.65 ft. It is defined to a gage-height of 5.31 ft and discharge of 400 cfs, approximately four times the historic high measurement. At 1845 August 5 a rain event washed out one of the rocks in the weir resulting in a shift of +0.30 feet. Sixteen discharge measurements (Nos. 466 – 481) were made this water year, ranging in discharge from 9.27 to 93.6 cfs. They cover the range in stage experienced, except for the lower daily flows of December 27, 2008, February 9, March 16 and the higher daily flows of May 19 – 27, June 3 – 7, 26 2009. The peak flow of 127 cfs occurred at 0645 June 26 at a gage height of 3.89 ft and a shift of -0.01 ft. It exceeded high measurement No. 474 made May 20, 2009 by 0.24 feet in stage.
Discharge.--	Shifting control method was used the entire water year. Shifts were applied as defined by measurements and distributed by time from 0000 October 1, 2008 to 1515 May 15 and from 1300 September 15 to the end of the water year. Two shift curves SC01, based on Msmts 473–478 (in use from 1500 May 15 thru 1700 August 5); and SC02, based on Msmts 479–481 (in use from 1800 August 5 (when a rock washed out of the weir) thru 1253 September 15), were used during runoff and through the summer period to account for gage height variability due to runoff from summer thunder storm events. Open water measurements show raw shifts ranging from 0.00 to +0.06 feet for rating 24 and shifts ranging from -0.05 to +0.35 for rating 25. All open water measurements were given full weight and shifts applied accordingly, except for measurement nos. 475 and 476, which were adjusted -5% and -4% for smoothing purposes.
Special Computations.--	Discharges for periods of ice effect were estimated based on six discharge measurements (No. 467 – 472), temperature record, partial days of usable data and trends in flow. It should be noted that the measurements during the period of ice were all made in open water. A hydrograph was used.
Remarks.--	Record fair except for periods of ice effect, May 15 weir construction, and the period from June 1 – 19 when the intakes was partially plugged, which should be considered poor. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO

RATING TABLE--

HURREDCO24 USED FROM 01-Oct-2008 TO 15-May-2009
HURREDCO25 USED FROM 15-May-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

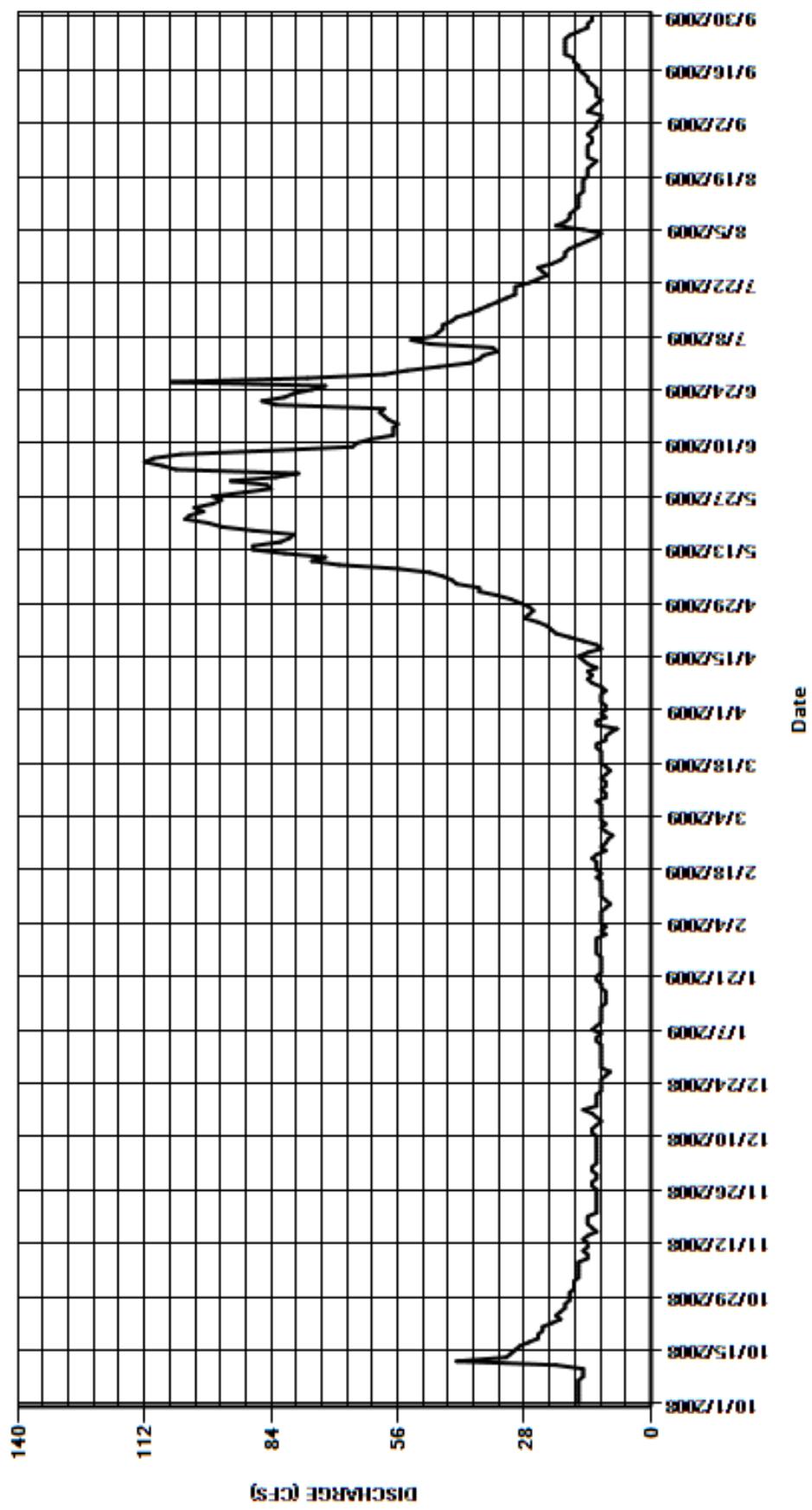
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	17	13	11	10	11	10	34	83	40	16	12
2	16	17	13	11	11	10	10	38	78	38	14	12
3	16	16	12	11	10	11	11	38	105	37	12	11
4	16	16	12	12	11	11	11	43	108	34	11	11
5	16	16	12	12	11	11	11	44	112	35	15	14
6	16	16	12	11	11	11	10	46	110	49	21	13
7	16	16	12	13	11	11	11	49	104	53	19	12
8	15	14	12	12	10	12	13	56	84	48	18	11
9	15	14	12	11	9	10	14	69	66	47	18	12
10	15	15	12	11	10	10	13	75	65	46	17	12
11	21	14	13	11	11	11	14	72	62	46	16	12
12	43	14	13	11	11	10	12	81	57	44	16	13
13	32	15	12	11	11	10	14	88	57	43	16	14
14	31	14	11	10	11	11	15	88	57	40	16	14
15	30	12	12	10	11	10	16	82	56	38	15	15
16	29	13	13	10	12	9	14	80	58	36	15	16
17	27	14	15	10	11	10	11	79	59	34	15	16
18	25	14	12	11	12	11	12	88	60	32	15	17
19	25	14	12	11	12	11	15	95	59	30	14	17
20	24	12	12	12	12	11	18	98	83	30	14	19
21	24	12	12	12	13	11	21	103	86	30	14	19
22	22	12	11	11	12	12	22	102	81	27	13	19
23	20	12	11	11	10	12	23	99	79	25	12	19
24	21	12	11	11	11	10	25	101	75	23	14	19
25	20	12	11	11	10	10	28	97	72	24	14	18
26	19	12	10	11	9.5	9	27	95	106	25	14	16
27	19	13	9	12	8.5	7.5	26	97	76	22	14	14
28	18	13	11	12	10	12	27	90	59	20	13	14
29	18	12	11	12	---	12	29	84	54	19	13	13
30	18	12	11	12	---	10	31	85	47	19	14	13
31	17	---	11	12	---	11	---	93	---	18	13	---
TOTAL	660	415	366.0	349	302.0	328.5	514	2389	2258	1052	461	437
MEAN	21.3	13.8	11.8	11.3	10.8	10.6	17.1	77.1	75.3	33.9	14.9	14.6
AC-FT	1310	823	726	692	599	652	1020	4740	4480	2090	914	867
MAX	43	17	15	13	13	12	31	103	112	53	21	19
MIN	15	12	9	10	8.5	7.5	10	34	47	18	11	11

CAL YR	2008	TOTAL	11571.0	MEAN	31.6	MAX	137	MIN	9	AC-FT	22950
WTR YR	2009	TOTAL	9531.5	MEAN	26.1	MAX	112	MIN	7.5	AC-FT	18910

MAX DISCH: 127 CFS AT 06:45 ON Jun.26,2009 GH 3.89 FT. SHIFT -0.01 FT.
MAX GH: 3.89 FT. AT 06:45 ON Jun.26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07111000 HUERFANOR AT MANZANARES XING. NR REDWING CO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07112500 HUERFANO RIVER AT BADITO
Water Year 2009

Location.-- Lat. 37°43'39", Long. 105°00'50" (Farisita, Colorado quadrangle, 1:24000 scale) in the E½ SE¼ Sec.5, T27S, R68W, Huerfano County on left bank, 30 feet downstream of the crossing of CR 616 bridge and Huerfano River.

Drainage and Period of Record.-- 532 sq mi. Apr 1, 1923 to Oct 31, 1925; Mar 1, 1938 to Sep 30, 1941; Oct 1, 1946 to Sep 30, 1954; Oct 1, 1993 to Jun 1999; May 4, 2005 to present.

Equipment.-- Sutron Satlink-2 satellite-monitored data collection platform (DCP) and Sutron Accubar in a 4' x 6' steel shelter. The primary reference gage is a concrete slope-gage immediately below the orifice. The Accubar was replaced June 22 with a Sutron Constant Flow Bubbler (CFB). A new orifice line and muffler were installed July 7. No other changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Gage height record is complete and reliable, except the following periods: November 7 – 30, December 1– 30, 2008, January 4 – 21, 24 – 31, February 1 – 5, 8 – 22, April 13, 14, 2009, due to ice on the control and in the channel affecting the stage-discharge relationship; Feb 27, 28, March 1 – 31, April 1 – 10, June 2 – 30, July 1 – 7, 2009, when there were problems with the accubar and CFB giving erratic and variable gage heights due primarily to the channel work done upstream. Channel work upstream was done as a result of the diversion dam failure in water year 2008. This work stripped the banks of all vegetation, which caused a large amount of material (mud and rock) and debris to wash downstream and deposit on the control. High watermarks of 3.96 ft noted on July 22 and 4.55 ft noted July 27 on the slope-gage are unverified due to the large amount of debris in the channel and the flow constriction caused by overgrowth immediately below the gage.

Datum Corrections.-- No levels were run this water year. Levels were last run on September 3, 2008 to check the marks on the slope-gage for accuracy; these were found to be off from 0.038 ft to 0.104 feet in elevation. No corrections were made.

Rating.-- The primary control at all stages is the channel, along with thick bank vegetation downstream and the upstream bridge at higher stages. The concrete apron structure at the gage was buried by mud and debris. Due to downstream channel fill and vegetation, shifts have continued to the left of the rating. The channel immediately below the gage narrows and has thick growth on either side. Extreme flows (gage height over 9 feet) will go into open field on both sides of the river 300+ feet across. Rating No. 2A dated May 23, 2005 was used from October 1, 2008 to the end of the water year. The rating is well defined to about 100 cfs with only a limited number of higher flow measurements. Seventeen discharge measurements (Nos. 106 – 122) were made this water year ranging in discharge from 7.61 to 33.8 cfs. They cover the range in stage experienced except for the lower daily flows of August 19, September 16, and the higher daily flows of May 1, 2, 21 – 30, and July 26, 27, 2009. The peak flow of 772 cfs occurred at 2030 July 26 at a gage height of 3.42 ft and shift of -0.24 ft. The peak exceeded measurement No.119 made July 27, 2009 by 1.75 feet in stage.

Discharge.-- Shifting-control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time from October 1, 2008 to 1500 July 7, 2009 and from 1800 August 25 to the end of the water year. Two variable-shifts were used HUEBADCOSC01 from 1530 July 7 to 2100 July 26 and HUEBADCOSC02 used from 2200 July 26 to 1700 August 2, 2009. Discharge measurements showed shifts ranging from -0.31 to +0.01 ft, with all measurements being made in open channel. All shifts were given full weight.

Special Computations.-- Periods of ice-effect were estimated based on seven measurements (Nos.107 – 113). The period of missing record was estimated using three measurements (Nos. 115 – 117). A hydrograph was used along with temperature record from the Walsenburg weather station and partial day data. to assist with estimation.

Remarks.-- Record is considered poor due to equipment problems with the Accubar sensor and the Constant Flow Bubbler resulting in a poor gage-height record, channel work upstream that cleared all vegetation from the banks, the lack of high water measurements and periods of ice-affected stage-discharge relationship. The peak is also rated poor due to the change in control conditions and lack of high flow measurements. Station maintained and record developed by Anthony D. Gutierrez.

Recommendations.-- Establish a new primary reference gage and abandon the slope gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07112500 HUERFANO RIVER AT BADITO

RATING TABLE--

HUEBADCO02A USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

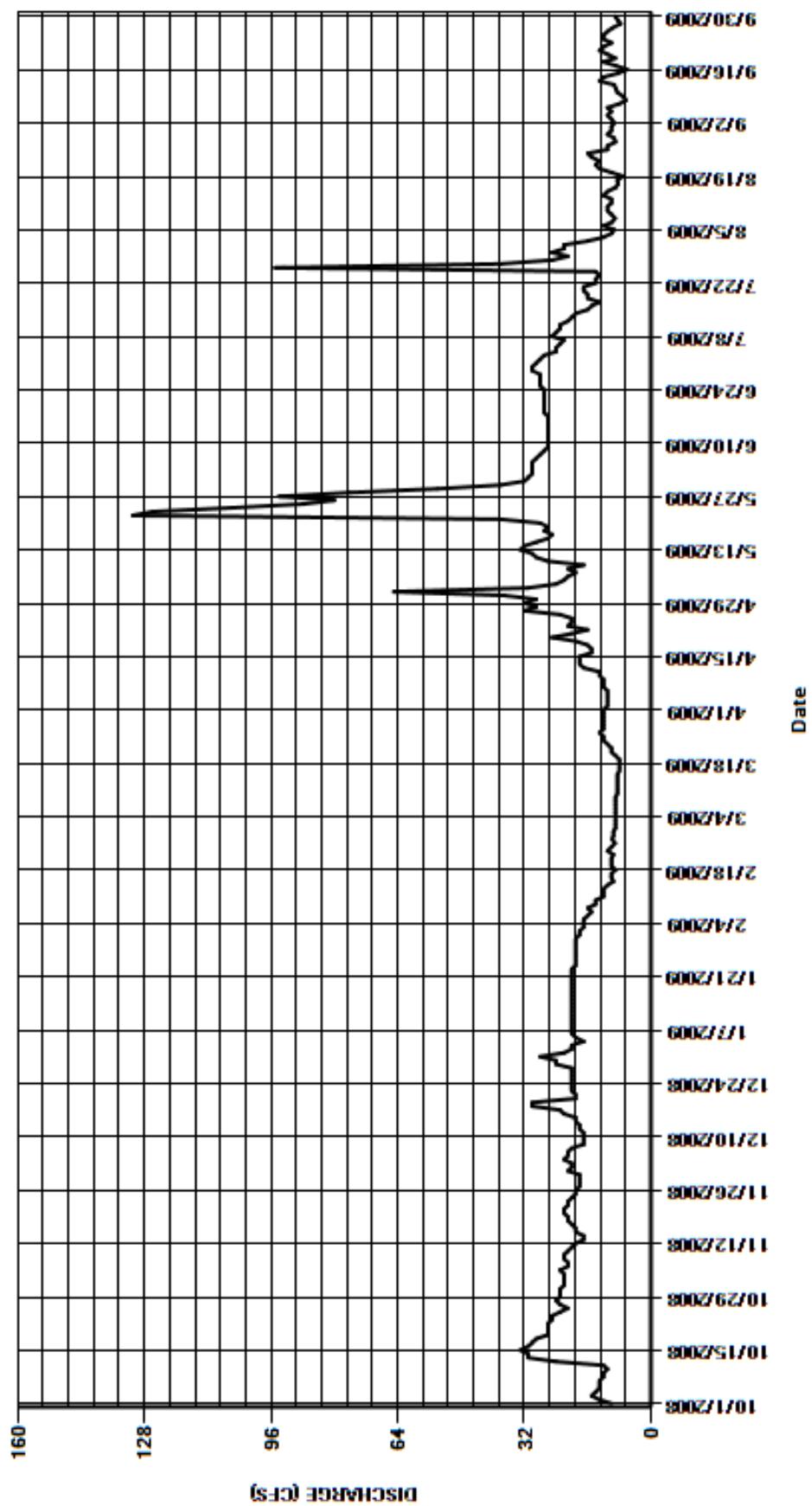
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	22	21	22	18	9	12	37	31	29	22	10
2	13	22	20	20	18	9	11	65	30	28	16	9.3
3	15	22	20	20	17	9	11	31	30	27	12	10
4	14	22	22	17	17	9	11	24	30	24	10	11
5	13	23	21	19	17	9	11	22	30	24	9.3	10
6	13	21	21	20	16	9	11	21	29	23	12	11
7	13	21	20	20	15	9	12	19	28	22	9.8	8
8	12	22	17	20	16	9	12	21	27	25	9.1	6.3
9	12	22	17	20	14	9	12	17	26	24	10	7.1
10	11	21	17	20	14	8.5	13	26	26	23	11	8.5
11	12	20	17	20	12	8.5	13	29	26	23	11	8.9
12	24	19	18	20	12	8.5	17	30	26	21	10	9.3
13	31	17	18	20	12	8.5	18	33	26	20	10	13
14	31	17	19	20	11	8.5	18	32	26	19	12	12
15	33	19	19	20	9.5	8.5	18	29	26	16	11	8.4
16	31	19	22	20	10	8	15	26	26	15	9	6
17	30	20	23	20	10	8	15	25	26	13	8.3	8.9
18	29	21	30	20	9	8	16	27	27	16	8.5	12
19	26	21	30	20	10	8	19	26	27	16	7.1	9
20	26	22	19	20	10	9	25	28	27	17	10	11
21	26	22	19	20	10	10	20	38	27	17	13	13
22	26	21	20	20	9.5	10	16	131	27	14	14	12
23	25	21	20	20	11	11	21	126	27	14	13	10
24	25	20	20	19	10	12	20	106	27	13	15	12
25	23	19	20	19	9.1	12	20	88	28	14	16	12
26	21	19	20	19	9.8	13	23	80	28	95	11	11
27	23	18	20	19	9.5	12	32	94	28	38	11	9.6
28	24	18	20	19	9.5	12	29	76	28	25	9	7.7
29	23	18	24	19	---	12	32	54	30	21	9.3	8.4
30	23	18	24	19	---	12	29	38	30	25	11	9.1
31	23	---	28	19	---	12	---	32	---	22	10	---
TOTAL	661	607	646	610	345.9	301.0	532	1431	830	723	350.4	294.5
MEAN	21.3	20.2	20.8	19.7	12.4	9.71	17.7	46.2	27.7	23.3	11.3	9.82
AC-FT	1310	1200	1280	1210	686	597	1060	2840	1650	1430	695	584
MAX	33	23	30	22	18	13	32	131	31	95	22	13
MIN	10	17	17	17	9	8	11	17	26	13	7.1	6
CAL YR	2008	TOTAL	8749.9	MEAN	23.9	MAX	402	MIN	6.8	AC-FT	17360	
WTR YR	2009	TOTAL	7331.8	MEAN	20.1	MAX	131	MIN	6	AC-FT	14540	

MAX DISCH: 772 CFS AT 20:30 ON Jul. 26,2009 GH 3.42 FT. SHIFT -0.24 FT.

MAX GH: 3.42 FT. AT 20:30 ON Jul. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07112500 HUERFANO RIVER AT BADITO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
Water Year 2009

Location.--	Latitude 37° 25' 12", Longitude 105° 03' 08" (Cuchara, Colorado quadrangle, 1:24000 scale) in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec.24, T30S, R69W, Huerfano County on left bank at Boyd Ranch, 29 feet downstream from private bridge, 6.5 miles southwest of La Veta CO on Highway 12.
Drainage and Period of Record.--	56 mi ² . Established October 1, 1934 by the State Engineer's Office. Record has been intermittently published by the USGS and the State Engineer's Office. The Colorado State Engineer's Office published the record from water years 1979 to 1987 and again from 1995 to the current water year.
Equipment.--	Sutron model 8210 satellite-monitored data collection platform (DCP) with a High Data Rate (HDR) radio transmitter, with shaft encoder, air temperature sensor, and graphic water-stage recorder in a 42-inch diameter corrugated metal pipe (CMP) shelter over 48-inch corrugated pipe well. Shaft encoder and chart are set to the reference mark on the front of the equipment shelf using a drop-tape. A supplemental outside staff gage is at this time not being used. The gage house was replaced with a 4'x4'x8' steel shelter on April 29 along with the construction of a rock weir control. No other changes this year.
Hydrographic Conditions.--	The gage is located in a gentle slope section of the Cucharas River Valley at an elevation of approximately 7,780 feet. There are several diversions upstream of the gage for agriculture and the town of Cuchara. State Highway 12 is parallel to the right riverbank at a higher elevation than pastureland adjacent to the left bank. Flooding would spill into the pasture on the left before flooding the highway. The gage is subject to freezing during the winter months.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods: October 22, 23, November 15, 20, 21, 29, 30, December 1, 4 – 6, 9 – 17, 21 – 31, 2008, January 1 – 31, February 1 – 15, 27, 28, March 1, 12 – 15, 26 – 28, and April 1, 2, and 5 – 7, 2009, when the stage-discharge relationship was affected by ice; and, April 23 – 29, 2009, when the gage house was replaced and weir construction was done.
Datum Corrections.--	Levels were run April 24, 2009 from RM No. 3 to establish the new RP and brass cap elevations. The drop tape was set to a wrong length at this time. Levels were run again on May 29 to RM 3 to correct the drop tape length. A datum correction of -0.62 ft was applied to the record for the period 1200 May 14 to 1230 May 29 when gage heights were incorrectly set using the incorrect tape length.
Rating.--	The control prior to the construction of the new rock weir was a rock riffle below the gage for flows up to about 50 cfs. The control at higher stages included the riverbanks, brush lined channel edges, and a downstream alignment bend. The new rock weir control is rated for flows up to 350 cfs by cross section. As more measurements are made at higher stages the rating curve will be more refined. Flows higher than 350 cfs are controlled by the brush lined bank on the right side since the left bank was constructed using 4 – 8 inch cobble with large rocks lining the bottom of the bank. Rating No. 14 dated October 1, 2000 was used up to April 23, 2009 when the new rock weir construction began. Rating No. 14 is well defined to about 150 cfs. Seven discharge measurements (Nos. 517 to 523) were made while using rating No. 14. These measurements ranged in discharges from 7.71 cfs to 20.9 cfs. They cover the range in stage experienced, except for the lower daily flows of November 20, 2008; January 17 – 31; February 1 – 7; March 13 and the higher flow of April 22, 2009. Rating No. 15 dated June 1, 2009 was used from April 29 to the end of the water year. Nine discharge measurements (Nos. 524 – 532) were made while using Rating No. 15. These measurements ranged in discharge from 8.46 cfs to 74.2 cfs. They cover the range in stage experienced, except for the lower daily flows of August 22 – 24, 26 – 28; September 1 – 8, 11, 2009. The peak discharge of 78.8 cfs occurred at 1215 on May 14, 2009 at a gage height of 2.51 ft, shift of 0.11 ft, and datum correction of -0.62 ft applied. The peak exceeded measurement No. 525 made on May 14 by 0.04 feet in stage.
Discharge.--	Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time from 00:00 October 1, 2008 to mid November 2008, from mid March 2009 to 10:30 April 23, and from 13:00 July 13, 2009 to the end of the water year. The period from mid November to mid March was ice affected. Two shift curves were used before and after the peak: CRBRLVCOSC01, used from 17:00 April 29 through 13:30 May 14 (peak) and CRBRLVCOSC02, used from 14:00 May 14 thru 12:30 July 13. Open water measurements indicated shifts varying from -0.17 to -0.15 ft for rating 14 and from 0.01 to 0.05 ft for rating 15. All open water measurements were given full weight and applied directly.
Special Computations.--	Discharges for periods of ice-affected record were estimated based on five measurements (Nos. 518 – 522), temperature records, and partial days of good record. A hydrograph and temperature graphs were used.
Remarks.--	The record is good, except during periods of ice effect and rock weir construction, which should be considered poor. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA

RATING TABLE--

CRBRLVCO14 USED FROM 01-Oct-2008 TO 23-Apr-2009
CRBRLVCO15 USED FROM 29-Apr-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

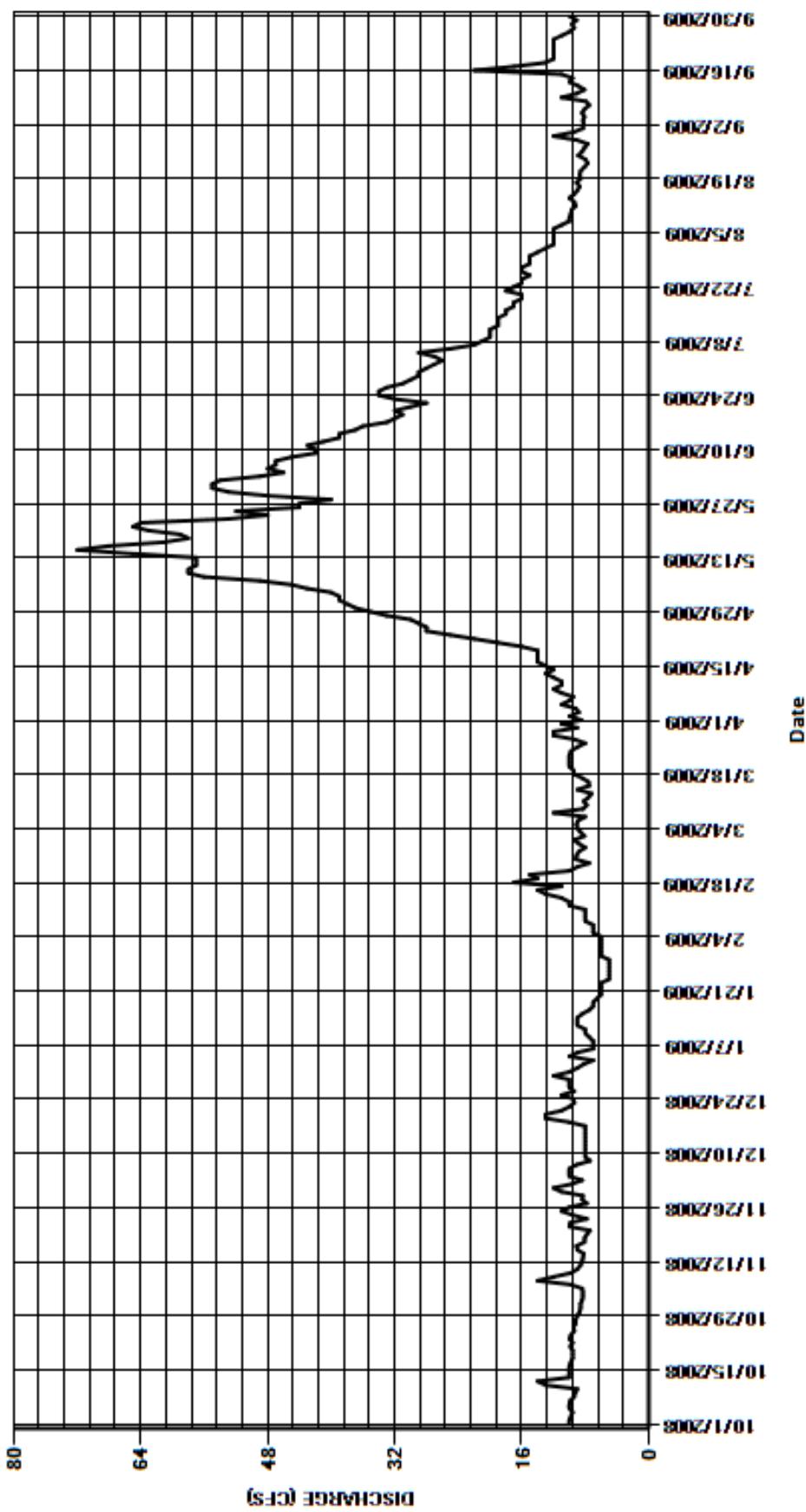
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	8.6	12	9	6	9.4	8.5	38	55	28	13	8.3
2	10	8.4	9.7	8.2	6	8.1	10	39	54	27	12	8.2
3	9.8	8.3	8.4	7	6	8.6	8.8	39	49	26	12	8.3
4	9.6	8.3	10	10	6	9	9.2	40	46	27	12	8.1
5	10	8.4	10	9	7	9.1	11	43	48	29	12	8.4
6	10	9.8	10	7	7	8.9	10	45	47	25	12	8.1
7	9.9	14	9.1	7	7	8	9.5	49	47	22	11	7.5
8	9.4	12	7.4	7	8	12	11	56	45	21	10	7.9
9	9.3	9.8	8	7.5	8	8.3	12	58	42	20	10	11
10	9	9	8	8	8	7.8	11	58	42	20	9.8	9.1
11	13	8.6	8	8	8	8.2	11	57	43	20	9.7	8.1
12	14	8.4	8	9	10	7.6	12	57	41	19	9.2	8.9
13	10	8.3	8	9	10	7.2	13	57	39	19	9.4	10
14	10	8.2	8	9	11	9	12	65	39	19	10	9.6
15	10	9	8	8.4	13	7.5	13	72	37	18	9.4	11
16	10	9.1	8	7.5	14	7.6	14	68	36	18	9	22
17	9.8	8.1	8	7	11	8.4	14	61	33	17	8.7	17
18	9.6	8.1	10	7	17	9.4	14	58	32	17	9.1	13
19	9.6	7.8	13	6.5	14	9.5	14	59	31	16	8.6	12
20	9.6	7.4	13	6	15	10	16	63	32	16	8.7	12
21	9.9	10	11	6	10	10	19	65	30	18	8.6	12
22	9.6	9.9	10	6	9	10	22	64	28	17	8.1	12
23	10	7.8	9.4	6	7.5	10	25	53	32	16	7.7	12
24	9.8	9.6	9.5	5	9.2	9.8	28	48	34	16	8	12
25	9.4	11	11	5	9.1	9	28	52	34	15	8.9	11
26	9.5	10	9.4	5	8.8	8	29	44	33	16	8.4	10
27	9.2	7.8	10	5	8	9.4	30	44	31	16	8.1	9.4
28	9.2	8.4	10	5	8.8	12	33	40	30	15	7.7	9.7
29	9	8.3	10	5	---	12	35	48	29	15	9.1	9.1
30	8.7	11	12	6	---	9	37	53	29	15	12	10
31	8.6	---	10	6	---	11	---	55	---	14	9.5	---
TOTAL	305.5	273.4	296.9	217.1	262.4	283.8	520.0	1648	1148	597	301.7	315.7
MEAN	9.85	9.11	9.58	7	9.37	9.15	17.3	53.2	38.3	19.3	9.73	10.5
AC-FT	606	542	589	431	520	563	1030	3270	2280	1180	598	626
MAX	14	14	13	10	17	12	37	72	55	29	13	22
MIN	8.6	7.4	7.4	5	6	7.2	8.5	38	28	14	7.7	7.5

CAL YR	2008	TOTAL	8305.6	MEAN	22.7	MAX	132	MIN	5.5	AC-FT	16470
WTR YR	2009	TOTAL	6169.5	MEAN	16.9	MAX	72	MIN	5	AC-FT	12240

MAX DISCH: 79 CFS AT 12:15 ON May. 14,2009 GH 2.51 FT. SHIFT 0.11 FT. (DATUM CORR. -0.62 FT APPLIED)
MAX GH: 2.51 FT. AT 12:15 ON May. 14,2009 (DATUM CORR. -0.62 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO
Water Year 2009

Location.-- Lat. $37^{\circ}33'02''$, Long. $104^{\circ}56'11''$, in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.6, T29S, R67W Huerfano County, on right bank at the Valley Road Harrison Bridge crossing of Cucharas River approximately $\frac{3}{4}$ mile south of the intersection of Valley Road and Highway 160.

Drainage and Period of Record.-- 196.16 sq.mi.

Equipment.-- Sutron model 8210 satellite-monitored data collection platform (DCP) and shaft encoder. The DCP is housed inside a 4' x 4' metal shelter at a higher elevation than the riverbank on the right side, while the shaft encoder is in a 20" x 30" metal "half" shelter atop an 18" diameter CMP stilling well attached to the center pier of Harrison Bridge. The shaft encoder is set using an electric tape inside of the well. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable, except for the following periods: Nov 6 – 9, 15 – 17, 21 – 23, 29, 30, Dec 1 – 31, 2008, Jan 1 – 20, 26 – 31, Feb 1, 2, 4, 8 – 22, 27, 28, Mar 1, 2, 8 – 16, 26, –31, Apr 1 – 8, 2009, when the stage-discharge relationship was affected by ice on the control; and, September 2-3, 2009 when the DCP failed.

Datum Corrections.-- No levels were run this year. Levels were last run Apr 4, 2007, from BM1 to a new RP for a new electric tape reference gage. The electric tape RP was established at Elev. 17.028 ft (gage datum) that day.

Rating.-- The control at low and medium flows up to 50 cfs is the shifting sand and gravel bed in the river channel. At medium to high stages the riverbanks and brush lining the edges of the channel as well as the center bridge pier, become part of the control. High flows of up to approximately 2000 cfs should be contained by the bridge. Extreme high flows can go out of channel to the flood plain north of the bridge, which is at a slightly lower elevation, and extends for approximately 200 feet to the north. Rating No. 2, dated Oct 1, 2003, was used the entire water year. Rating No. 2 was developed using measurement history and a theoretical rating extension based on channel survey work and is well defined to about 500 cfs. Thirteen discharge measurements (No. 105 to 117) were made during water year. Two of those measurements (No. 116 and 117) noted a trace of water or no water. Measured discharges ranged from 0.00 cfs to 49.3 cfs. They cover the range in stage experienced, except for the higher daily flows of May 2 – 13, 21 – 24, 2009. The peak flow of 144 cfs occurred at 1600 on May 21, 2009 at a gage height of 2.95 ft and shift of -0.21 ft. It exceeded the highest measured flow (No.111) made on May 4, 2009 by 0.47 feet in stage.

Discharge.-- Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time from Oct 1, 2008, to 1310 March 19, 2009, and from 1700 July 27 to the end of the water year. Shifts were distributed by stage using two variable stage-shift relationships: CRHBLVCOSC01, used from 1330 March 19 to 1600 May 21, and, CRHBLVCOSC02 used from 1700 May 21 to 1600 July 27, 2009. Open water measurements indicated shifts varying from -0.21 to -0.05 feet. Measurements were given full weight and applied directly, except Measurement 114 was discounted -5% for smoothing purposes. WY09 measurements were generally rated 'fair' to 'poor'. Measurements have continued to show shifts to the left of the rating.

Special Computations.-- Discharge for periods of ice-affected record was estimated on the basis of four measurements (Nos. 106 – 109), temperature records from the NWS Walsenburg weather station and partial days of usable record. Hydrograph and temperature graphs were used.

Remarks.-- Record is fair, except during periods of ice effect and no gage height, which are poor. Station maintained and record developed by Anthony D. Gutierrez.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO

RATING TABLE--

CRHBLVCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

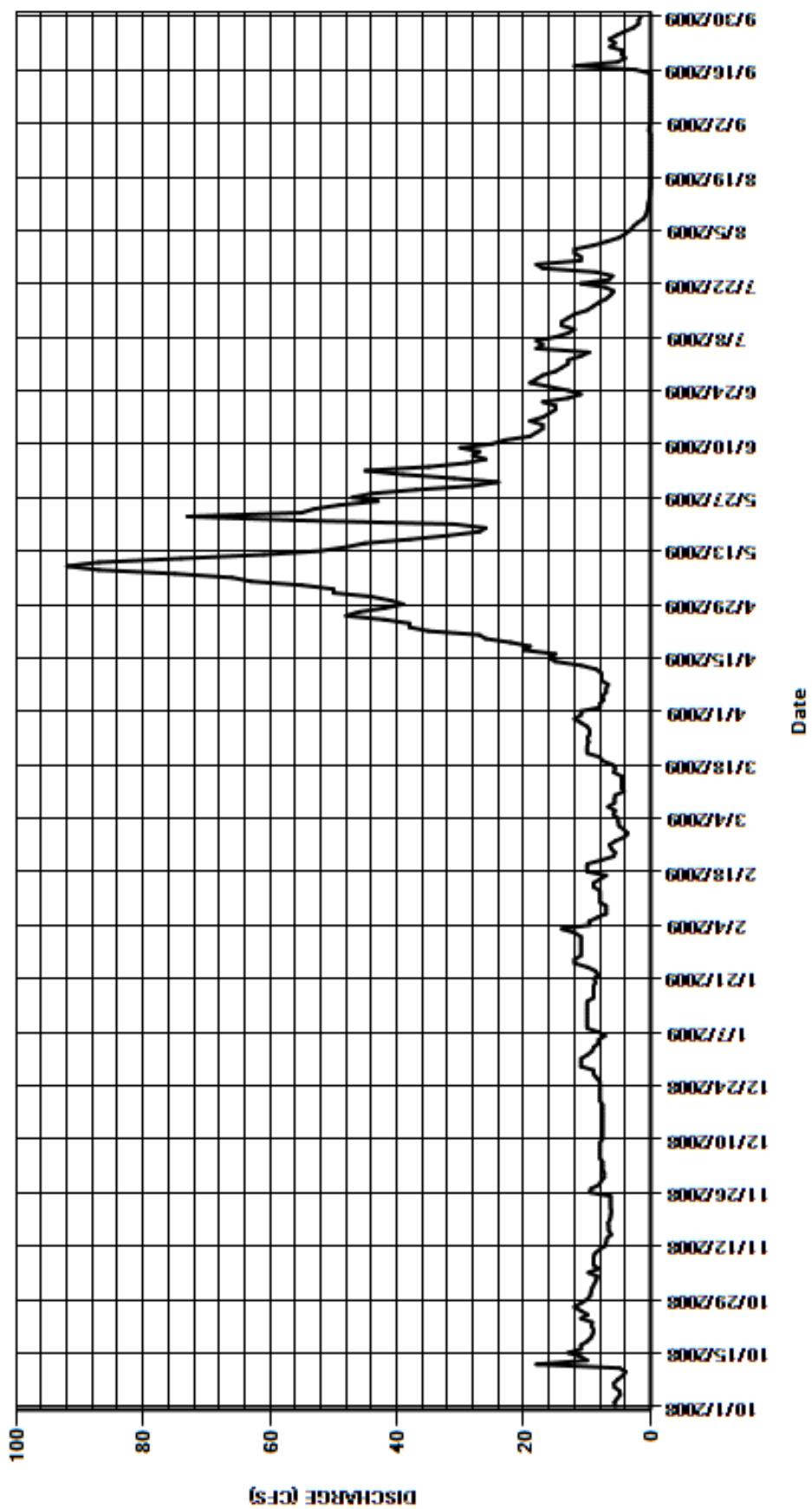
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.6	9.2	7.3	10	11	4.2	11	44	31	13	9	0.21
2	5.7	8.9	7.6	9.2	12	5	8	50	39	13	6.9	0
3	5.3	8.6	7.6	9	14	5.1	8	50	45	11	5	0
4	4.8	8.4	7.6	8.2	9.6	5.2	7.4	55	35	9.7	4	0
5	4.9	9.8	8	8.2	9.7	5.9	7.6	63	29	18	3.2	0
6	5.7	8.2	8	7.2	8.4	5.6	7	66	26	17	2.7	0
7	5.8	9	8	8.2	7	6.7	7	75	28	18	2	0
8	5.2	9	8	10	7	5.7	6.7	87	27	15	1.1	0
9	4.4	9	8	10	7	5.7	7.7	92	30	13	0.74	0
10	3.9	8.8	7.6	10	8	5.6	7.7	87	25	12	0.56	0
11	4.9	8.1	7.6	10	8	4.2	7.8	74	23	14	0.41	0
12	18	7.2	7.6	10	8	4.6	8.6	61	19	14	0.35	0
13	10	7	7.6	10	8	4.6	11	52	18	13	0.22	0
14	11	6.9	7.6	10	9	4.6	15	48	17	12	0.12	0
15	13	6.2	7.6	10	9	4.6	16	45	17	10	0.12	0
16	11	6.6	7.6	9	8	5.8	15	38	19	9.1	0.03	2.4
17	11	6.6	7.6	9	7	5.6	20	32	17	8.2	0	12
18	10	6.7	7.6	9	10	6	19	27	16	7	0	5.2
19	9.4	6.4	7.6	9	10	7.6	22	26	15	6.3	0	4
20	9.1	6.3	8	8.7	10	8	26	31	15	5.8	0	4.6
21	9	6.2	8	8.9	7.8	10	27	56	17	7.1	0	4.4
22	9.3	6.3	8	8.3	5.8	10	35	73	13	11	0	6.4
23	9.2	6.3	8	8.7	5.6	10	38	55	11	6.6	0	5.6
24	11	6.3	8	10	6.2	9.8	38	53	13	6	0	6.5
25	9.9	6.3	8	12	6.5	10	42	49	16	8.6	0	5.4
26	11	9.6	8.5	12	5.6	9.6	48	43	19	17	0	4.1
27	12	9.4	9	11	4.2	9.6	46	47	18	18	0	2.7
28	11	8.1	9	11	3.6	10	42	44	17	11	0	1.9
29	10	7.8	11	11	---	11	39	37	15	11	0	1.9
30	9.5	7.3	11	11	---	12	41	28	14	12	0	1.5
31	9.4	---	11	11	---	11	---	24	---	12	0.23	---
TOTAL	270.0	230.5	253.6	299.6	226.0	223.3	634.5	1612	644	359.4	36.68	68.81
MEAN	8.71	7.68	8.18	9.66	8.07	7.2	21.1	52	21.5	11.6	1.18	2.29
AC-FT	536	457	503	594	448	443	1260	3200	1280	713	73	136
MAX	18	9.8	11	12	14	12	48	92	45	18	9	12
MIN	3.9	6.2	7.3	7.2	3.6	4.2	6.7	24	11	5.8	0	0
CAL YR	2008	TOTAL	7215.1	MEAN	19.7	MAX	99	MIN	3.9	AC-FT	14310	
WTR YR	2009	TOTAL	4858.39	MEAN	13.3	MAX	92	MIN	0	AC-FT	9640	

MAX DISCH: 144 CFS AT 16:00 ON May. 21,2009 GH 2.95 FT. SHIFT -0.21 FT.

MAX GH: 2.95 FT. AT 16:00 ON May. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
OXFORD FARMERS DITCH COMPANY
Water Year 2009

Location.-- Lat. 38°10'34", Long. 104°08'42", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005, approximately 0.33 mi upstream from Arkansas River at Nepesta Rd. Bridge river gage.

Drainage and Period of Record.-- N/A

Equipment.-- Sutron SatLink DCP/logger with High Data Rate radio and shaft encoder in a stilling well inside a wood frame shelter. A float-activated A-35 graphic water-stage recorder is also in the stilling well. Twelve-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of the 15-minute satellite-monitored data with DCP log data and the graphic chart recorder used for backup purposes. Record is complete and reliable. The period from November 15 to March 15 there is no flow.

Datum Corrections.-- No levels were run to the flume this water year.

Rating.-- The control is a standard, 12-foot, concrete Parshall Flume. A standard 12-ft Parshall Flume table was used all year. Negative shifts are thought to be due to sand and moss build up in the flume. The well and flume were cleaned five times between April and September. Two discharge measurements numbers 12 and 13, were made this year, they cover the range in stage except for the lower daily flows of October 1 – 11, 2008; March 27 – 29; April 4 – 7, 11 – 13; May 2, 28; July 11, 12; August 5; September 7, 8, 11 – 30, 2009; and the higher daily flows of April 18 – 30; May 6, 7, 13 – 26, 30, 31; June 1 – 30; July 1 – 10, 13 – 16, 23, 24, 27 – 31, and August 1 – 3, 2009. The gage is shut down from 0000 Nov 15 until 0000 Mar 15 for the Winter Water Storage Program. The peak flow of 139 cfs occurred at 0415 June 28, 2009 at a gage height of 1.98 ft and shift of 0.00 ft. It exceeded measurement No. 13 by 0.81 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. A stage-shift relationship based on historical measurements was continued in use from the end of WY08 and applied from October 1 through November 15. This shift curve is supported by measurement #12 (made in October 2008). Measurement 13 made in April 2009 was discounted 2% to a 0.00 ft shift, and the 12 ft Parshall Flume rating was applied directly to the gage height record for the period March 15 to the end of the water year.

Special Computations.--

Remarks.-- Record is considered fair due to the sand and moss buildup that occurs in the flume during the irrigation season, which introduces uncertainty into the actual shift that should be applied, and also due to the poor precision of the gage heights (chatter) measured in the stilling well. The Arkansas River near Nepesta CO gaging station was moved from above the Oxford Farmers Ditch diversion to the Nepesta Road Bridge below the Oxford diversion beginning October 1, 2000. For consistency and comparison with historical record published prior to WY2001 in this reach of the Arkansas River, the Oxford Ditch mean daily discharge is combined with the mean daily discharge measured at Arkansas River at Nepesta Road Bridge near Nepesta CO gaging station. Station maintained and record developed by Anthony D. Gutierrez.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

OXFORD FARMERS DITCH COMPANY

RATING TABLE--

STD12FTP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	33	0	0	0	0	49	54	101	126	124	48
2	22	35	0	0	0	0	48	14	75	127	125	49
3	21	36	0	0	0	0	26	55	112	127	124	48
4	21	35	0	0	0	0	16	55	123	127	34	47
5	22	35	0	0	0	0	17	55	123	127	0	47
6	22	35	0	0	0	0	17	64	123	126	38	49
7	22	35	0	0	0	0	17	63	123	125	50	4.9
8	22	34	0	0	0	0	37	56	124	127	51	0
9	22	33	0	0	0	0	49	54	124	125	51	26
10	22	33	0	0	0	0	27	53	124	105	50	28
11	21	32	0	0	0	0	18	53	123	0	50	21
12	26	32	0	0	0	0	17	53	121	19	50	15
13	37	32	0	0	0	0	17	86	122	122	50	14
14	36	24	0	0	0	0	46	120	125	122	50	16
15	36	0.29	0	0	0	27	60	127	125	122	49	14
16	36	0	0	0	0	25	57	126	125	76	49	15
17	36	0	0	0	0	26	57	129	124	49	48	15
18	36	0	0	0	0	27	83	134	124	48	49	16
19	36	0	0	0	0	26	97	131	125	50	49	15
20	35	0	0	0	0	34	97	127	125	50	49	14
21	36	0	0	0	0	35	97	124	125	49	49	14
22	37	0	0	0	0	35	97	126	125	50	49	14
23	37	0	0	0	0	36	96	126	125	83	49	13
24	36	0	0	0	0	36	82	128	125	63	49	13
25	35	0	0	0	0	36	68	126	125	47	49	13
26	35	0	0	0	0	36	68	120	128	50	50	13
27	35	0	0	0	0	16	67	47	130	103	50	13
28	34	0	0	0	0	4.3	67	0	130	126	50	13
29	34	0	0	0	---	12	68	47	127	126	50	14
30	33	0	0	0	---	36	70	79	127	126	50	14
31	34	---	0	0	---	49	---	79	---	126	49	---
TOTAL	939	464.29	0.00	0.00	0.00	496.30	1632	2611.00	3658	2849.00	1684.00	635.90
MEAN	30.3	15.5	0	0	0	16	54.4	84.2	122	91.9	54.3	21.2
AC-FT	1860	921	0	0	0	984	3240	5180	7260	5650	3340	1260
MAX	37	36	0	0	0	49	97	134	130	127	125	49
MIN	21	0	0	0	0	0	16	0	75	0	0	0

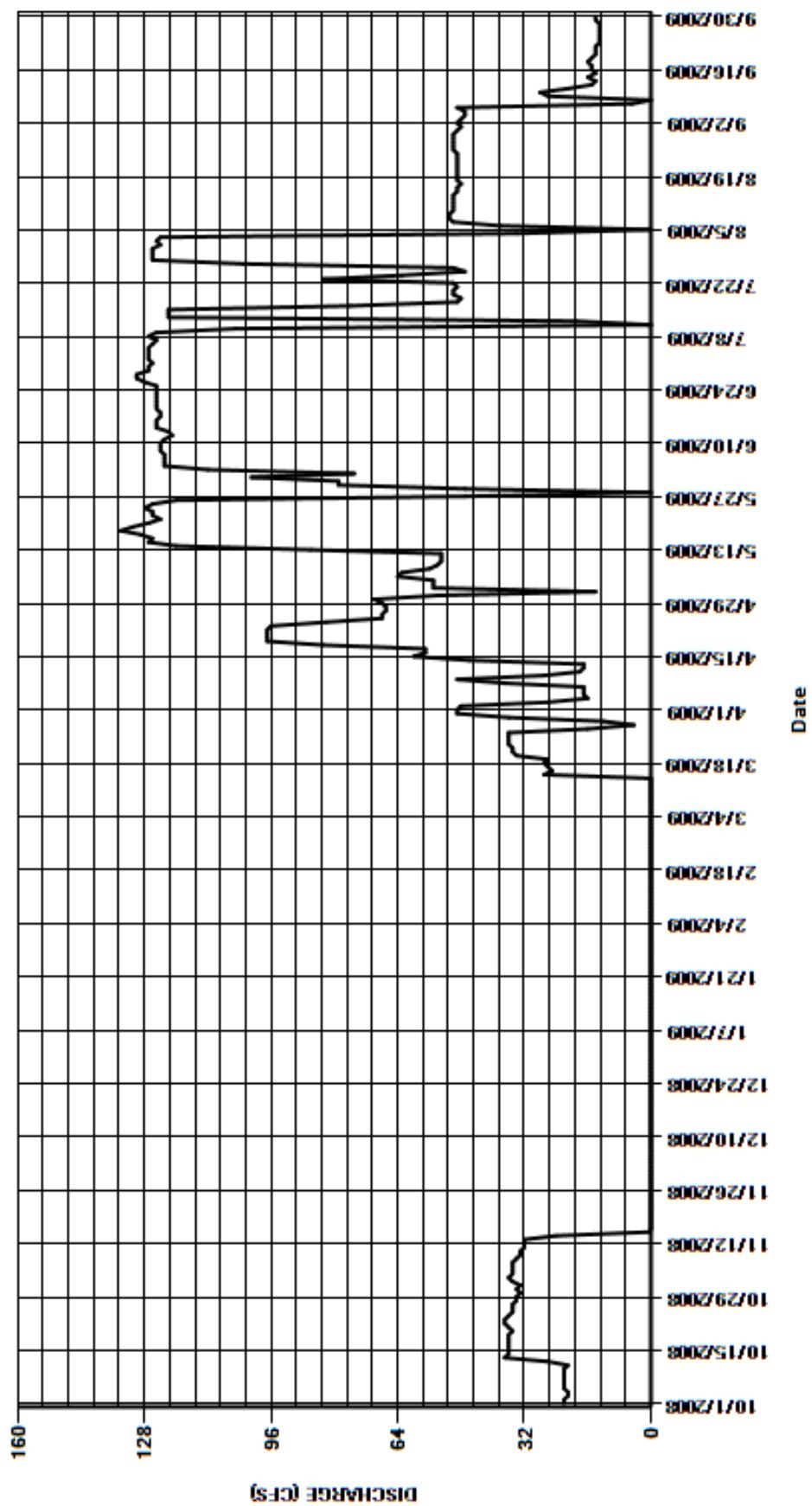
CAL YR	2008	TOTAL	17923.29	MEAN	49	MAX	128	MIN	0	AC-FT	35550
WTR YR	2009	TOTAL	14969.49	MEAN	41	MAX	134	MIN	0	AC-FT	29690

MAX DISCH: 139 CFS AT 04:15 ON Jun. 28,2009 GH 1.98 FT. SHIFT 0 FT.

MAX GH: 1.98 FT. AT 04:15 ON Jun. 28,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

OXFORD FARMERS DITCH COMPANY
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO
Water Year 2009

Location.--	Lat. 38°10'44", Long. 104°08'20", in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005, on the left bank downstream side of the Nepesta Road Bridge crossing the Arkansas River, 0.8 mi downstream of Kramer Creek, 9 mi downstream from Huerfano River, 1 mile NNW of the Nepesta Cemetery.
Drainage and Period of Record.--	9,345 mi ² of which 54 sq.mi. is probably noncontributing (furnished by the U.S Army Corp of Engineers). Established May 1, 1901. Intermittent record until June 1921 at various sites and datums above the current site. From June 1921 to September 30, 2000 at various sites within 2 miles of the present site. At present site October 1, 2000 through current water year.
Equipment.--	Sutron 8210 High Data Rate satellite-monitored data collection platform (DCP), Sutron Accubar with constant nitrogen bubbling using a site feed assembly with purge valves and air temperature sensor in a 4' x 4' steel shelter. The primary reference gage is a wire weight located in the same river section as the end of the Accubar orifice line with muffler and attached to the bridge approximately 120 ft south of the gage shelter. No changes were made this water year.
Hydrographic Conditions.--	The gage is located at the Pueblo County Road 613 bridge over the Arkansas River on a fairly straight stretch of river that extends from about 800 feet upstream to a half mile downstream of the gage. The gage elevation is 4380 ft MSL. The riverbed consists of moving sand at all stages. Upstream sluice outlets from the Colorado Canal, Rocky Ford Highline Canal and Oxford Farmers Ditch as well as Fountain Creek contribute a supply of loose sand, especially during the irrigation season and high water. The channel width is 280 feet at the gage and widens considerably above and below the gage. The upper basin consists of mountain topography above Pueblo Reservoir. The lower basin consists of several unregulated tributaries below Pueblo (Fountain Creek, Salt Creek, the St. Charles River, Six Mile Creek, and the Huerfano River), large agricultural areas, and urban runoff from Pueblo and Colorado Springs.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log data used for backup. Record is complete and reliable, except for the periods: December 5, 6, 9, 14 – 25, 27, 28, 31, 2008, January 4, 5, 10 – 18, 21, 24 – 31, February 2 – 5, 11 – 21, 28, March 1, 14, 15, 26 – 29, 2009, when ice affected the stage-discharge relationship; and, November 30-December 2, 2008, when there were problems with the DCP and no data were collected.
Datum Corrections.--	Levels were run May 4, 2009 to the wire weight check-bar using RM No. 1 as base. The gage reading at the check-bar was found to be 0.003' high, no correction needed.
Rating.--	The primary control at all stages is a shifting sand channel at and downstream of the gage. At the gage, the channel is contained by the county road bridge and the railroad bridge, which is 30 feet upstream. Flows of up to approximately 5000 cfs are contained in a well-defined channel under the bridge. At higher flows, large riprap, which continues up to the bottom of the bridge, and heavy vegetation on both banks below the bridge, become part of the control. The rating is well defined to 25,000 cfs by high water mark on the bridge and indirect measurement made in May 1999. Discharge measurements of up to 1500 cfs can be made approximately 400 – 500 feet downstream of the bridge, with higher flows measured from the bridge. Extremely low discharge measurements (less than 50 cfs) are made as much as a quarter of a mile upstream, near the Oxford Farmers Ditch flume. Rating No. 16 was used the entire water year. This rating was developed as the result of large negative shifts in previous years, this rating incorporated both high flow (USGS indirect measurement) and extreme low flows (due to drought conditions). An estimated PZF of 10.42 feet in gage height was used. Nineteen discharge measurements (Nos. 186 – 204) were made this water year ranging in discharge from 93.1 to 2150 cfs. They cover the range in stage experienced except for the lower daily flows of February 13-23, 25-28; March 1-4, 2009 and the higher daily flows of May 16-19, 21, 25-27, 2009. The peak discharge of 2810 cfs occurred at 0830 on May 21, 2009 at a gage height of 14.46 ft, a shift of -0.04 ft, and a gage height correction of -0.01 ft applied. It exceeded measurement No. 197 made June 3, by 0.40 ft in stage.
Discharge.--	Shifting-control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time from October 1, 2008 to 1127 April 15, 2009 and from 1200 September 14 to end of the water year. Three variable shift curves were applied: ARKNEPCOSC01, from 1127 April 15, 2009 to 1800 May 22, ARKNEPCOSC02 from 1800 May 22 to 1115 July 22, and ARKNEPCOSC03 from 1200 July 22 to 1115 September 14, 2009. Discharge measurements showed shifts ranging from -0.44 ft to 0.00 ft, with all measurements being made in open channel. Measurements 189 – 192 were all made in open and clear channel conditions, which were preceded by and followed periods of ice affected gage height. All measurements were given full weight with the exception of measurement 199, which was discounted 1 percent for smoothing purposes.
Special Computations.--	Estimated flow during periods of ice effect and Accubar malfunction were made using adjacent good gage height and the temperature sensor data. A hydrograph was used.
Remarks.--	Record is considered fair due to the number of discharge measurements made this water year, except for periods of ice affected gage height and Accubar malfunction, during which the record is considered poor. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO

RATING TABLE-- ARKNEPCO16 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

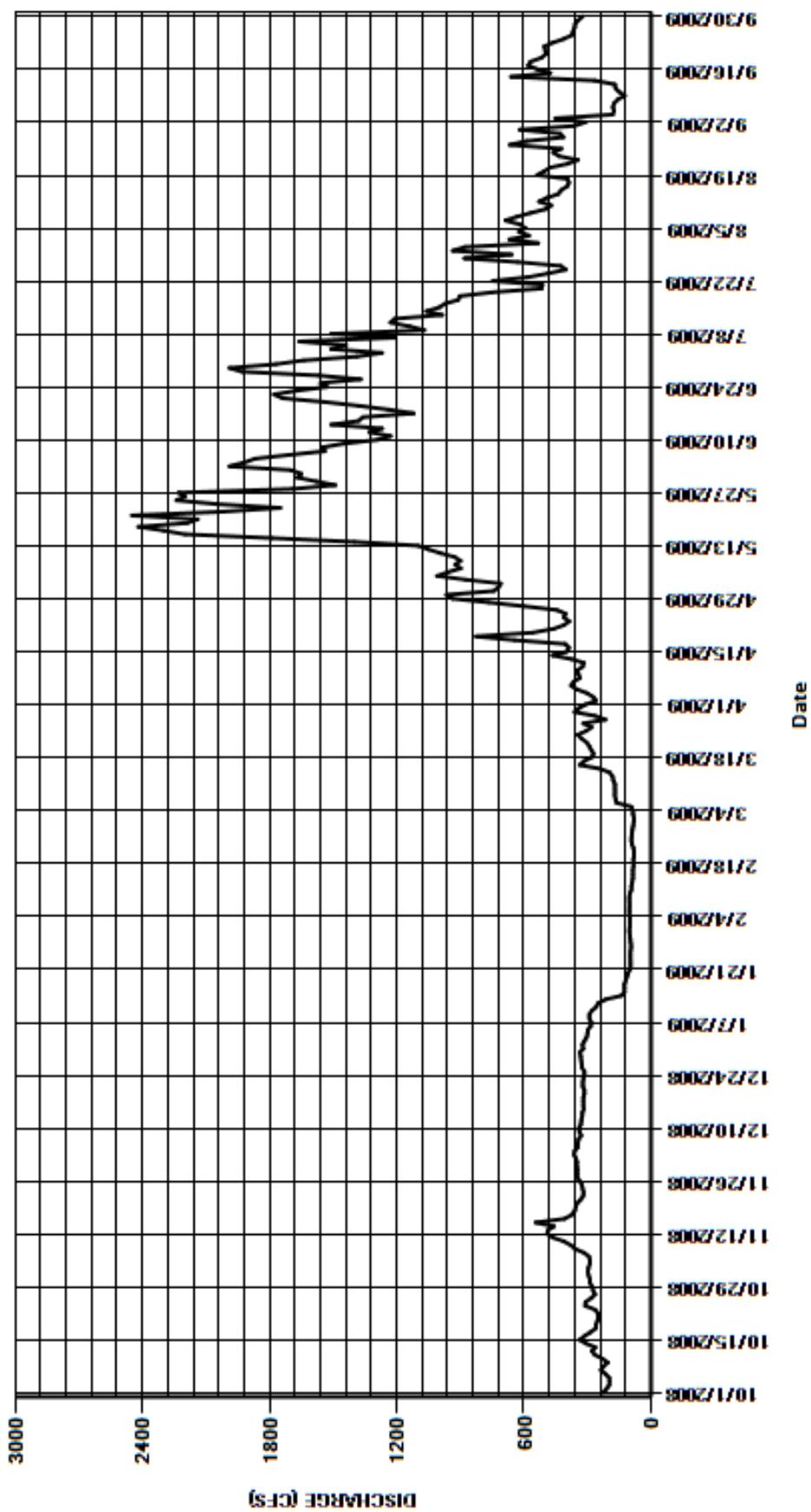
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	228	295	350	324	101	82	310	743	1650	1640	533	362
2	210	298	355	315	100	81	259	720	1700	1390	669	310
3	198	296	364	304	101	85	273	710	1990	1270	576	452
4	197	290	360	300	100	87	302	874	1920	1510	624	181
5	198	289	345	298	103	94	351	1010	1870	1440	593	175
6	216	293	345	284	103	163	378	959	1710	1660	621	180
7	237	316	343	283	101	168	366	898	1540	1210	688	174
8	225	358	330	292	103	171	336	925	1550	1510	633	157
9	204	378	338	292	103	170	343	899	1450	1070	567	124
10	230	410	340	280	100	171	350	927	1290	1140	498	151
11	265	463	331	259	93	171	323	993	1230	1230	471	168
12	279	490	330	250	93	179	317	1050	1330	1210	528	171
13	263	487	325	215	89	182	375	1100	1270	986	491	266
14	307	458	325	140	86	195	465	1400	1510	1060	438	661
15	337	545	318	125	86	240	397	1790	1380	1000	425	476
16	314	408	320	125	86	337	387	2200	1360	972	396	537
17	286	375	320	126	84	317	405	2300	1120	910	388	580
18	262	361	320	120	82	281	643	2420	1240	903	394	569
19	261	356	315	114	84	271	826	2190	1380	750	538	518
20	253	351	315	108	80	283	559	2140	1540	517	505	497
21	248	333	322	100	80	292	461	2450	1740	513	476	499
22	251	321	322	96	83	304	411	2020	1780	747	393	504
23	265	319	320	96	90	329	386	1750	1670	582	345	465
24	311	323	315	98	93	346	412	2050	1530	486	434	412
25	309	327	315	98	92	306	403	2240	1560	402	463	374
26	283	338	327	96	90	280	445	2200	1370	427	423	368
27	264	349	328	94	88	320	601	2230	1570	629	667	361
28	274	348	330	96	84	215	767	1690	1930	881	586	358
29	278	348	332	98	---	265	936	1490	1990	658	414	343
30	288	350	336	100	---	361	966	1580	1770	936	429	322
31	289	---	320	102	---	341	---	1670	---	878	620	---
TOTAL	8030	10873	10256	5628	2578	7087	13753	47618	46940	30517	15826	10715
MEAN	259	362	331	182	92.1	229	458	1536	1565	984	511	357
AC-FT	15930	21570	20340	11160	5110	14060	27280	94450	93110	60530	31390	21250
MAX	337	545	364	324	103	361	966	2450	1990	1660	688	661
MIN	197	289	315	94	80	81	259	710	1120	402	345	124

CAL YR	2008	TOTAL	267343	MEAN	730	MAX	3480	MIN	78	AC-FT	530300
WTR YR	2009	TOTAL	209821	MEAN	575	MAX	2450	MIN	80	AC-FT	416200

MAX DISCH: 2810 CFS AT 08:30 ON May. 21,2009 GH 14.45 FT. SHIFT -0.04 FT. (GH CORR. -0.01 FT APPLIED)
 MAX GH: 14.45 FT. AT 08:30 ON May. 21,2009 (GH CORR. -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA
Water Year 2009

Location.-- Combined record from Arkansas River at Nepesta Rd. Bridge gage: Lat 38° 10' 44", Long 104° 8' 20", in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005 and Oxford Farmers Ditch gage: Lat. 38°10'34",Long. 104° 08'42", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005.

Drainage and Period of Record.-- 9,345 mi 2 .

Equipment.-- See individual records for gage equipment descriptions.

Hydrographic Conditions.--

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of mean daily discharge was obtained by the addition of Oxford Farmers Ditch mean daily flows to the corresponding mean daily flows in the Arkansas River at Nepesta Road Bridge. Mean daily discharge was estimated on the following days: November 30, December 1, 2, 5, 6, 9, 14 – 25, 27, 28, 31, 2008, January 4, 5, 10 – 18, 21, 24 – 31, February 2 – 5, 11 – 21, 28, March 1, 14, 15, 26 – 29, 2009. The peak unit value combined discharge for the year was 2940 cfs at 08:30 May 21, 2009.

Special Computations.--

Remarks.-- Combined record is fair, except during periods of estimated flow, which should be considered poor. The Arkansas River near Nepesta CO gaging station was moved from above the Oxford Farmers Ditch diversion to the Nepesta Road bridge below the diversion beginning October 1, 2000. For consistency and comparison with previously published historical record in this reach of the Arkansas River, the total Arkansas River flow is computed by combining the Oxford Ditch mean daily discharge with the mean daily discharge measured at Arkansas River at Nepesta Road Bridge near Nepesta CO gaging station. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

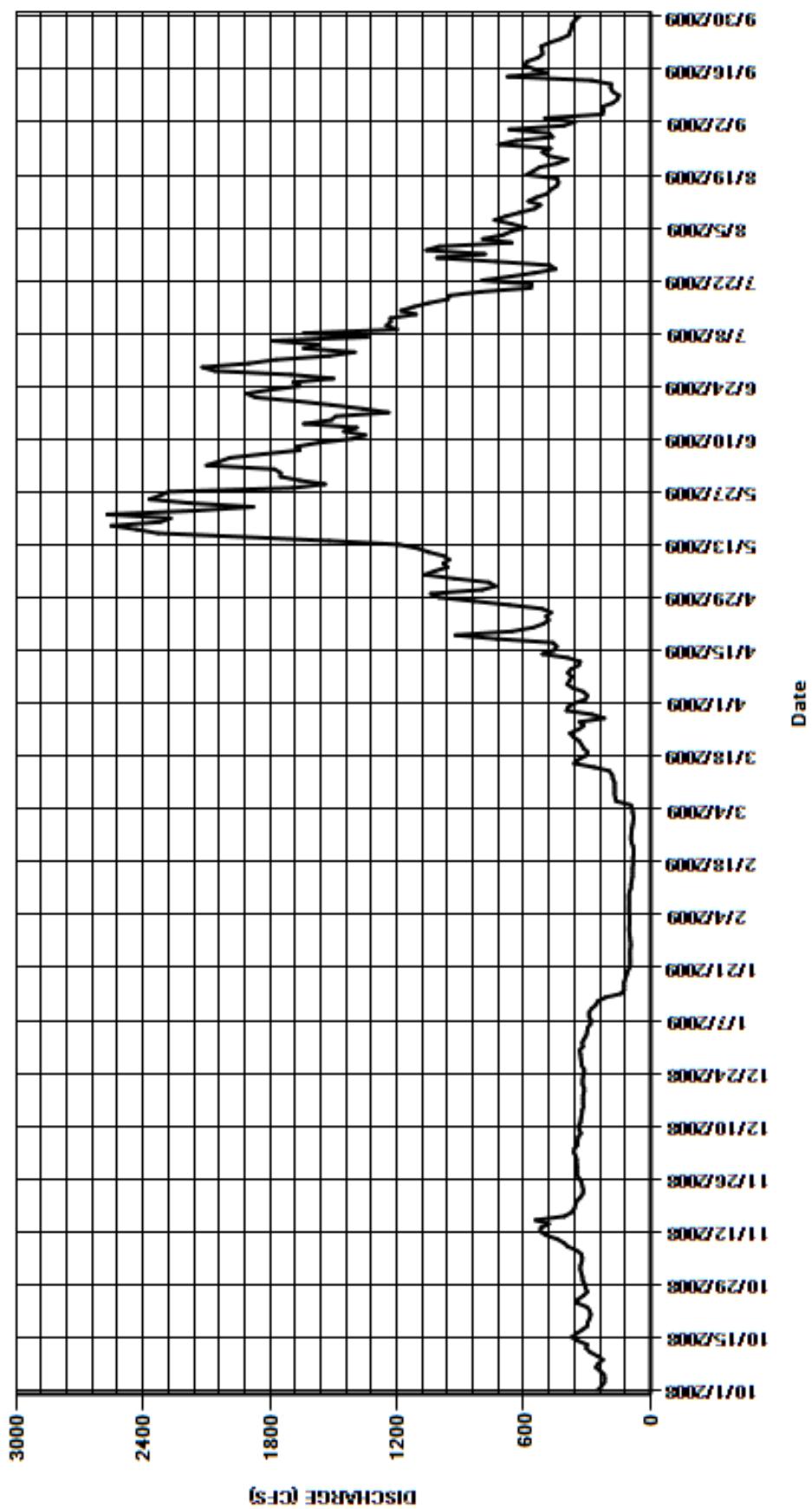
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	250	328	350	324	101	82	359	797	1750	1770	657	410
2	232	333	355	315	100	81	307	734	1780	1520	794	359
3	219	332	364	304	101	85	299	765	2100	1400	700	500
4	218	325	360	300	100	87	318	929	2040	1640	658	228
5	220	324	345	298	103	94	368	1070	1990	1570	593	222
6	238	328	345	284	103	163	395	1020	1830	1790	659	229
7	259	351	343	283	101	168	383	961	1660	1340	738	179
8	247	392	330	292	103	171	373	981	1670	1640	684	157
9	226	411	338	292	103	170	392	953	1570	1200	618	150
10	252	443	340	280	100	171	377	980	1410	1250	548	179
11	286	495	331	259	93	171	341	1050	1350	1230	521	189
12	305	522	330	250	93	179	334	1100	1450	1230	578	186
13	300	519	325	215	89	182	392	1190	1390	1110	541	280
14	343	482	325	140	86	195	511	1520	1640	1180	488	677
15	373	545	318	125	86	267	457	1920	1510	1120	474	490
16	350	408	320	125	86	362	444	2330	1490	1050	445	552
17	322	375	320	126	84	343	462	2430	1240	959	436	595
18	298	361	320	120	82	308	726	2550	1360	951	443	585
19	297	356	315	114	84	297	923	2320	1510	800	587	533
20	288	351	315	108	80	317	656	2270	1670	567	554	511
21	284	333	322	100	80	327	558	2570	1870	562	525	513
22	288	321	322	96	83	339	508	2150	1910	797	442	518
23	302	319	320	96	90	365	482	1880	1800	665	394	478
24	347	323	315	98	93	382	494	2180	1660	549	483	425
25	344	327	315	98	92	342	471	2370	1690	449	512	387
26	318	338	327	96	90	316	513	2320	1500	477	473	381
27	299	349	328	94	88	336	668	2280	1700	732	717	374
28	308	348	330	96	84	219	834	1690	2060	1010	636	371
29	312	348	332	98	---	277	1000	1540	2120	784	464	357
30	321	350	336	100	---	397	1040	1660	1900	1060	479	336
31	323	---	320	102	---	390	---	1750	---	1000	669	---
TOTAL	8969	11337	10256	5628	2578	7583	15385	50260	50620	33402	17510	11351
MEAN	289	378	331	182	92.1	245	513	1621	1687	1077	565	378
AC-FT	17790	22490	20340	11160	5110	15040	30520	99690	100400	66250	34730	22510
MAX	373	545	364	324	103	397	1040	2570	2120	1790	794	677
MIN	218	319	315	94	80	81	299	734	1240	449	394	150
CAL YR	2008	TOTAL	285237	MEAN	779	MAX	3600	MIN	101	AC-FT	565800	
WTR YR	2009	TOTAL	224879	MEAN	616	MAX	2570	MIN	80	AC-FT	446000	

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER
Water Year 2009

Location.-- Lat. 38°07'33", Long. 103°54'41", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County, Hydrologic Unit 11020005, at Catlin Canal gage, on right bank 2.2 mi downstream from diversion dam for Catlin Canal, 2.3 mi downstream from Apishapa River, and 6.0 mi east of Fowler.

Drainage and Period of Record.-- 10,901 mi 2 . October 1964 to current year.

Equipment.-- Satellite-monitored data collection platform (Sutron Model 8210 DCP) with Sutron Constant Flow Bubbler (CFB) housed in an 8' x 8' shelter. This DCP also monitors the Catlin Canal's flume gage height and USGS water quality sensors. The primary reference gage is an outside staff gage. A cableway approximately 2 miles upstream of the gage is used for high flow measurements. A concrete flood block is used to anchor the bubbler orifice line for the river gage.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP log data with the CFB log and satellite data used for backup. The record is complete and reliable, except the following ice affected periods: December 15-17, 20-22, 2008, January 26-31, February 1-2, 2009.

Datum Corrections.-- Levels were last run on August 22, 2008 using RM No. 12 as base. The outside staff gage was found to be reading 0.03 feet high and was corrected on that date.

Rating.-- A shifting sand channel is the control at all stages with heavily vegetated bank areas forming part of the control during high flow periods (gage heights of 9.5 feet and above). Rating ARKCACO11, dated June 26, 2003, was used for the entire water year. Eighteen discharge measurements (Nos. 1174-1191) were made throughout the water year covering a range in discharge from 51 cfs to 1780 cfs. Measurement Nos. 1177 and 1181 were made by the USGS. The measurements cover the range in stage except for the higher flow days: May 17-19, 21, 25-27, June 3-5, 2009. The peak discharge of 2210 cfs occurred at 1615 on May 21, 2009 at a gage height of 4.86 ft and shift of -0.24 feet. It exceeded high flow measurement No. 1185 made on May 19, 2009 by 0.40 ft in stage.

Discharge.-- A shifting control methodology was used throughout the water year. Shifts were distributed by time proration from October 1, 2008 to 1330 Apr 9, 2009, and from 0100 Sep 26, 2009 to the end of the water year. Shifts were distributed by stage using variable shift curves ARKCACOSC009A, implemented for the period April 9, 2009 to May 21, 2009, and ARKCACOSC009B, implemented for the period May 21, 2009 to September 26, 2009. Discharge measurements yielded shifts ranging from -0.24 feet (Measurement No. 1185) to +0.24 feet (Measurement No. 1174).

Special Computations.-- Discharge for periods affected by ice were estimated using adjacent periods of good record and by analysis of upstream and downstream USGS and State of Colorado stream gages.

Remarks.-- Record is good, except for periods of ice effect, which should be considered poor. Station maintained and record developed by Adam Adame.

Recommendations.-- Since this record is affected by sluice operations on the Catlin Canal, it is recommended that more measurements be taken at the sluice to verify the sluice rating CATSLUCO02.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER

RATING TABLE-- ARKCATCO11 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	70	149	341	342	161	56	199	582	1490	1530	648	271
2	64	168	356	355	125	55	134	561	1620	1470	480	228
3	63	157	358	358	133	55	59	567	1810	1270	511	265
4	68	162	337	359	123	56	66	636	2030	1450	477	238
5	79	168	316	338	112	57	95	760	1890	1440	452	89
6	73	161	292	358	93	87	119	741	1780	1530	363	94
7	80	189	282	353	87	162	127	621	1510	977	413	74
8	66	206	292	378	99	177	87	584	1400	1370	386	93
9	79	206	310	383	111	174	55	597	1270	1160	275	173
10	71	236	325	384	99	173	63	626	1050	984	212	160
11	135	319	337	387	74	175	47	705	929	1130	164	198
12	186	376	350	376	68	167	32	793	1110	1110	222	203
13	143	426	357	346	66	158	92	844	1040	882	254	221
14	172	385	350	225	66	207	240	994	1390	850	208	363
15	252	699	290	161	69	130	186	1360	1180	893	218	258
16	237	552	280	155	74	228	122	1640	1300	773	202	255
17	162	399	310	162	71	283	111	1870	1010	706	196	239
18	124	321	381	155	66	168	183	1790	988	631	197	341
19	98	319	409	152	64	85	649	1790	1180	595	224	276
20	85	332	390	142	63	75	384	1620	1200	422	257	244
21	106	318	290	125	61	94	218	1920	1340	305	242	279
22	128	304	300	121	61	78	156	1720	1450	639	237	279
23	131	294	402	122	59	82	105	1550	1410	458	194	257
24	164	275	372	120	57	95	98	1660	1330	267	200	237
25	232	287	394	122	57	104	116	1920	1370	207	237	205
26	204	307	467	104	57	101	92	1920	1280	157	209	161
27	162	309	422	125	56	290	277	1910	1330	749	267	138
28	146	312	366	135	55	174	343	1430	1550	710	296	120
29	143	320	395	184	---	61	556	1290	1720	704	209	90
30	142	339	363	150	---	248	710	1270	1580	869	209	67
31	147	---	355	169	---	245	---	1450	---	1040	311	---
TOTAL	4012	8995	10789	7346	2287	4300	5721	37721	41537	27278	8970	6116
MEAN	129	300	348	237	81.7	139	191	1217	1385	880	289	204
AC-FT	7960	17840	21400	14570	4540	8530	11350	74820	82390	54110	17790	12130
MAX	252	699	467	387	161	290	710	1920	2030	1530	648	363
MIN	63	149	280	104	55	55	32	561	929	157	164	67

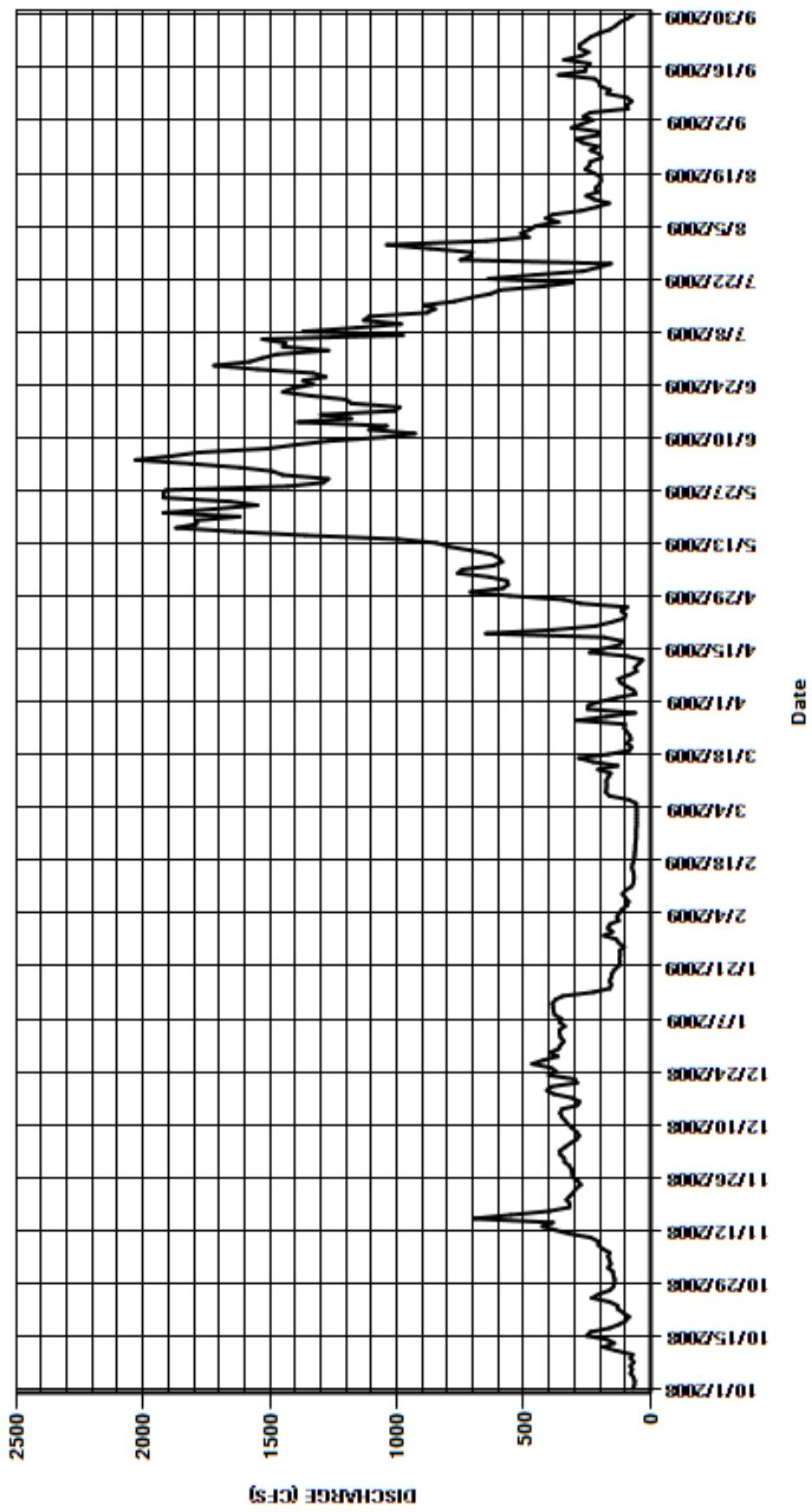
CAL YR	2008	TOTAL	206136	MEAN	563	MAX	2330	MIN	25	AC-FT	408900
WTR YR	2009	TOTAL	165072	MEAN	452	MAX	2030	MIN	32	AC-FT	327400

MAX DISCH: 2210 CFS AT 16:15 ON May. 21,2009 GH 4.86 FT. SHIFT -0.24 FT.

MAX GH: 4.86 FT. AT 16:15 ON May. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER
Water Year 2009

Location.-- Lat. 38°07'33", Long. 103°54'41", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County, Hydrologic Unit 11020005, at river gage.

Drainage and Period of Record.-- N/A

Equipment.-- Float-activated graphic water-stage recorder and shaft encoder in 8' x 8' shelter with well (with equipment for Arkansas River below Catlin Dam near Fowler CO river gage). Shaft encoder is connected to satellite-monitored data collection platform (DCP) used for river gage. Fifteen-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP log data with satellite data and the graphic chart recorder used for backup purposes. Record is complete and reliable.

Datum Corrections.-- Levels were last run 8 Oct 2003.

Rating.-- The control is a standard, 15-foot, concrete, Parshall flume. A standard 15-ft Parshall Flume table was used all year. Two discharge measurements (Nos. 17, 18) were made this year. The peak flow of 321 cfs occurred at 0830 on May 21, 2009 at a gage height of 2.92 ft and shift of 0.00 ft. It exceeded the stage of measurement No. 18, made August 12, 2009 by 0.57 feet in stage.

Discharge.-- Msmt. No. 17 was discounted 3% to 0.00 ft shift. Msmt. No. 18 shift was 0.00 ft. Discharge record was computed by direct application of the rating with zero shift.

Special Computations.--

Remarks.-- Record good. Station maintained and record developed by Adam Adame.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER

RATING TABLE--

STD15FTPf USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	197	150	0	0	0	0	186	285	212	308	245	229
2	180	152	0	0	0	0	205	271	194	308	246	156
3	172	155	0	0	0	0	233	247	172	302	244	137
4	156	157	0	0	0	0	230	249	174	300	248	189
5	167	160	0	0	0	0	228	247	176	294	248	143
6	169	163	0	0	0	0	231	245	176	284	262	151
7	180	162	0	0	0	0	250	245	198	272	279	148
8	180	163	0	0	0	0	277	246	202	273	276	107
9	180	164	0	0	0	0	286	246	212	278	277	22
10	175	164	0	0	0	0	285	246	224	247	277	1.4
11	191	163	0	0	0	0	285	247	224	247	278	1.4
12	189	164	0	0	0	0	275	246	225	247	248	1.4
13	188	162	0	0	0	0	282	244	225	248	241	1.3
14	189	161	0	0	0	0	294	247	233	248	221	127
15	188	3.9	0	0	0	141	299	258	250	248	201	225
16	187	0	0	0	0	210	286	280	254	248	202	189
17	188	0	0	0	0	217	267	290	254	246	203	234
18	188	0	0	0	0	254	265	296	253	245	203	247
19	188	0	0	0	0	265	264	295	252	247	238	243
20	188	0	0	0	0	266	263	293	283	246	252	230
21	168	0	0	0	0	265	265	309	302	247	247	206
22	156	0	0	0	0	267	265	300	304	240	246	216
23	156	0	0	0	0	266	278	281	297	246	246	205
24	156	0	0	0	0	273	283	256	280	247	246	203
25	152	0	0	0	0	278	283	244	279	246	243	201
26	151	0	0	0	0	240	283	237	295	247	218	201
27	151	0	0	0	0	157	282	236	304	243	211	202
28	151	0	0	0	0	144	278	223	303	242	255	201
29	150	0	0	0	---	137	270	213	304	231	233	200
30	151	0	0	0	---	148	282	214	307	227	156	188
31	149	---	0	0	---	186	---	213	---	247	199	---
TOTAL	5331	2243.90	0.00	0.00	0.00	3714.00	7960	7949	7368	7999	7389	4805.5
MEAN	172	74.8	0	0	0	120	265	256	246	258	238	160
AC-FT	10570	4450	0	0	0	7370	15790	15770	14610	15870	14660	9530
MAX	197	164	0	0	0	278	299	309	307	308	279	247
MIN	149	0	0	0	0	0	186	213	172	227	156	1.3

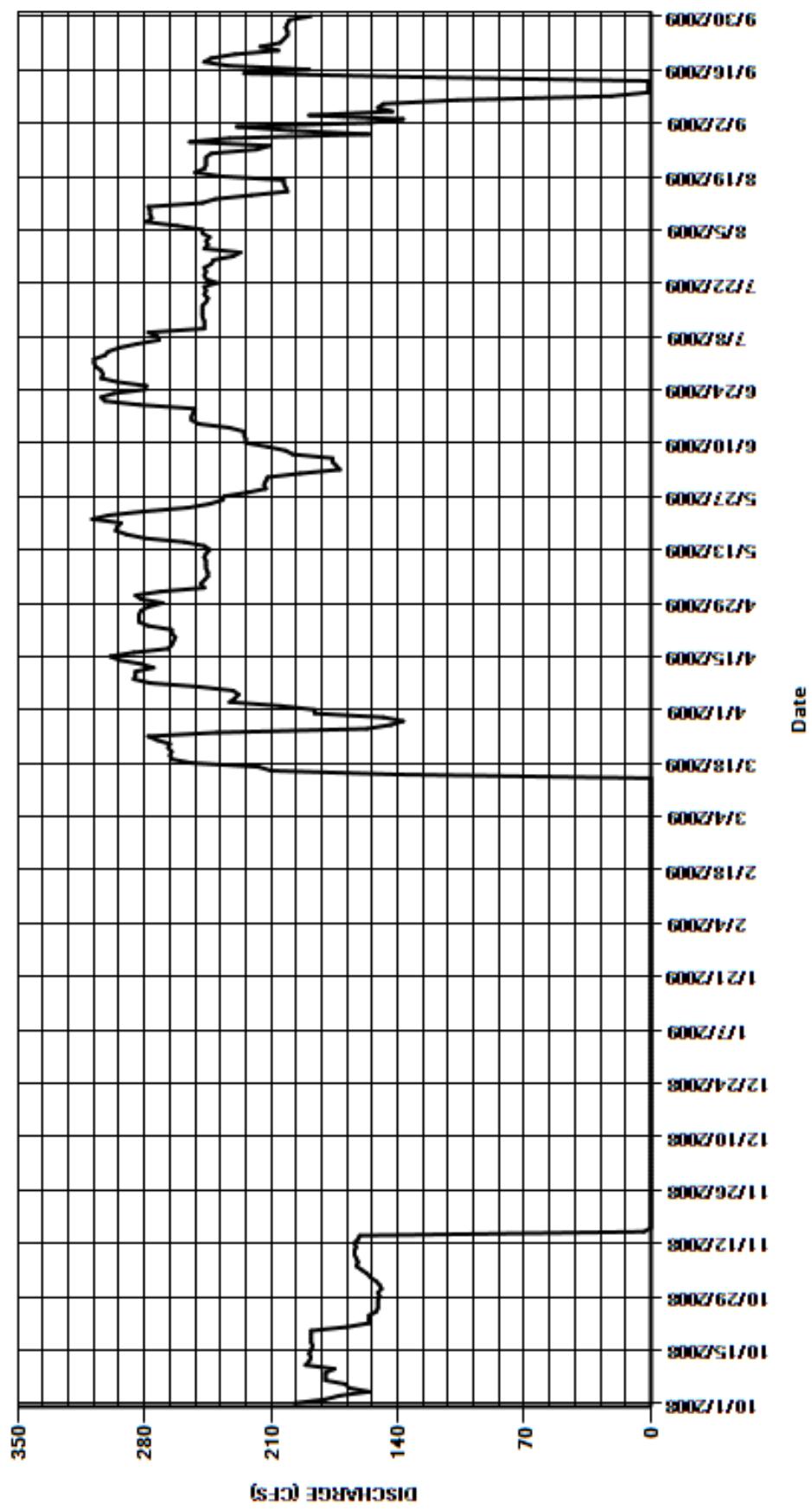
CAL YR	2008	TOTAL	61424.24	MEAN	168	MAX	343	MIN	0	AC-FT	121800
WTR YR	2009	TOTAL	54759.40	MEAN	150	MAX	309	MIN	0	AC-FT	108600

MAX DISCH: 321 CFS AT 08:30 ON May. 21,2009 GH 2.92 FT. SHIFT 0 FT.

MAX GH: 2.92 FT. AT 08:30 ON May. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
ARKANSAS RIVER AND CATLIN CANAL (COMBINED)
Water Year 2009

Location.-- Combined record from Arkansas River below Catlin Dam and Catlin Canal gages both located at Lat 38°07'33", long 103° 54'41", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County.

Drainage and Period of Record.-- 10,901 mi².

Equipment.-- See individual records for gage equipment descriptions.

Hydrographic Conditions.--

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of discharges was obtained by the addition of Catlin Canal daily flows to the corresponding daily flows in the Arkansas River below Catlin Dam. Mean daily discharge was estimated on the following days: December 15-17, 20-22, 2008, January 26-31, February 1-2, 2009. The peak unit value combined discharge for the year was 2530 cfs at 1615 on May 21, 2009.

Special Computations.--

Remarks.-- Combined record is good, except during periods of estimated flow, which should be considered poor. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ARKANSAS RIVER AND CATLIN CANAL (COMBINED)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

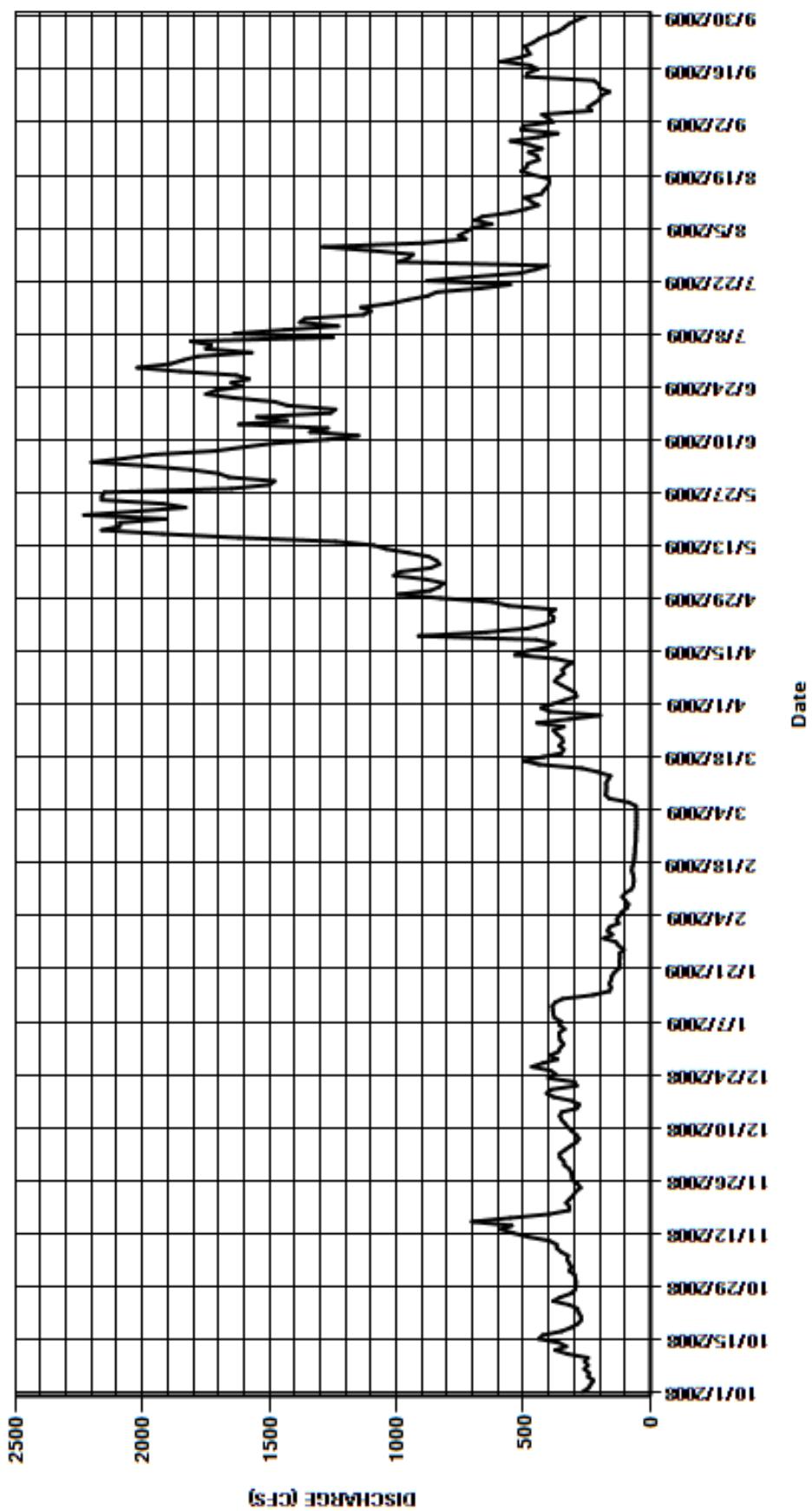
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	267	299	341	342	161	56	385	867	1700	1840	893	500
2	244	320	356	355	125	55	339	832	1810	1780	726	384
3	235	312	358	358	133	55	292	814	1980	1570	755	402
4	224	319	337	359	123	56	296	885	2200	1750	725	427
5	246	328	316	338	112	57	323	1010	2070	1730	700	232
6	242	324	292	358	93	87	350	986	1960	1810	625	245
7	260	351	282	353	87	162	377	866	1710	1250	692	222
8	246	369	292	378	99	177	364	830	1600	1640	662	200
9	259	370	310	383	111	174	341	843	1480	1440	552	195
10	246	400	325	384	99	173	348	872	1270	1230	489	161
11	326	482	337	387	74	175	332	952	1150	1380	442	199
12	375	540	350	376	68	167	307	1040	1340	1360	470	204
13	331	588	357	346	66	158	374	1090	1270	1130	495	222
14	361	546	350	225	66	207	534	1240	1620	1100	429	490
15	440	703	290	161	69	271	485	1620	1430	1140	419	483
16	424	552	280	155	74	438	408	1920	1550	1020	404	444
17	350	399	310	162	71	500	378	2160	1260	952	399	473
18	312	321	381	155	66	422	448	2090	1240	876	400	588
19	286	319	409	152	64	350	913	2090	1430	842	462	519
20	273	332	390	142	63	341	647	1910	1480	668	509	474
21	274	318	290	125	61	359	483	2230	1640	552	489	485
22	284	304	300	121	61	345	421	2020	1750	879	483	495
23	287	294	402	122	59	348	383	1830	1710	704	440	462
24	320	275	372	120	57	368	381	1920	1610	514	446	440
25	384	287	394	122	57	382	399	2160	1650	453	480	406
26	355	307	467	104	57	341	375	2160	1580	404	427	362
27	313	309	422	125	56	447	559	2150	1630	992	478	340
28	297	312	366	135	55	318	621	1650	1850	952	551	321
29	293	320	395	184	---	198	826	1500	2020	935	442	290
30	293	339	363	150	---	396	992	1480	1890	1100	365	255
31	296	---	355	169	---	431	---	1660	---	1290	510	---
TOTAL	9343	11239	10789	7346	2287	8014	13681	45677	48880	35283	16359	10920
MEAN	301	375	348	237	81.7	259	456	1473	1629	1138	528	364
AC-FT	18530	22290	21400	14570	4540	15900	27140	90600	96950	69980	32450	21660
MAX	440	703	467	387	161	500	992	2230	2200	1840	893	588
MIN	224	275	280	104	55	55	292	814	1150	404	365	161
CAL YR	2008	TOTAL	267575	MEAN	731	MAX	2640	MIN	86	AC-FT	530700	
WTR YR	2009	TOTAL	219818	MEAN	602	MAX	2230	MIN	55	AC-FT	436000	

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER AND CATLIN CANAL (COMBINED)
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
ARKANSAS RIVER NEAR ROCKY FORD
Water Year 2009

Location.-- Lat. 38°03'52", Long. 103°41'24" in SE ¼, NW ¼, Sec. 9, T23S, R56W, Hydrologic Unit 11020005, Otero County, on right bank of Arkansas River, approximately 250 feet upstream from State Highway 266, and approximately 1.6 miles NE of Rocky Ford, Colorado.

Drainage and Period of Record.-- 11,438 sq. mi. Gage established October 8, 1992.

Equipment.-- High data rate Sutron 8210 DCP and Sutron Constant Flow Bubbler (CFB) in a 4' x 4' steel gage shelter. A wire weight gage installed on upstream side of Hwy 266 bridge is the primary reference gage from the beginning of WY08 until September 25, 2008, when an angle iron was installed on the floodblock and a drop tape RP was surveyed in. The drop tape is the primary reference gage from September 25, 2008 forward. The new reference gage is installed in the same river section as the bubbler gage (the wire weight reference gage was downstream). No other changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable for the entire water year, except for the following periods: Dec 15-25, 2008, and, Jan 5-7, 10-17, 24-30, 2009, due to ice affecting the stage-discharge relationship.

Datum Corrections.-- Levels last were run on Sep. 25, 2008. An RP was surveyed in for a new drop tape reference gage. A new reference mark (RM #6) was established on the downstream, riverside corner of the floodblock. No datum corrections were taken as a result of levels.

Rating.-- The control is a sand channel with earthen banks at low to medium flows. Rating No. 2 dated Oct. 1, 2003 was used the entire water year. Eighteen discharge measurements (Nos. 341-358) were made this water year ranging in discharge from 23.8 to 2000 cfs. WY2009 measurements cover the range in stage experienced. The peak discharge of 2240 cfs occurred at 0615 on Jun 4, 2009 at a gage height of 3.96 ft and shift of -0.10 ft. It exceeded the stage of measurement No. 352 made June 5, 2009, by 0.15 ft.

Discharge.-- Shifting control method was used all year. Shifts were prorated by time from Oct 1 2008 until 1500 April 29 2009, and from 1500 Aug 7 2009 to the end of the water year. Shifts were distributed by stage using two variable stage-shift relationships: SC09A, used from 1600 Apr 29, 2009 until 0615 Jun 4, 2009; and, SC09B, used from 0700 Jun 4, 2009 until 1419 Aug 7, 2009. Open water measurements this water year showed shifts varying between -0.10 and +0.21 feet.

Special Computations.-- Discharge for periods affected by ice were estimated using adjacent periods of good record. A comparison hydrograph was used to compare daily average flows with upstream and downstream gages.

Remarks.-- Record is fair, except for periods of ice effect which should be considered poor. Station maintained and record developed by Adam Adame .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ARKANSAS RIVER NEAR ROCKY FORD

RATING TABLE--

ARKROCCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

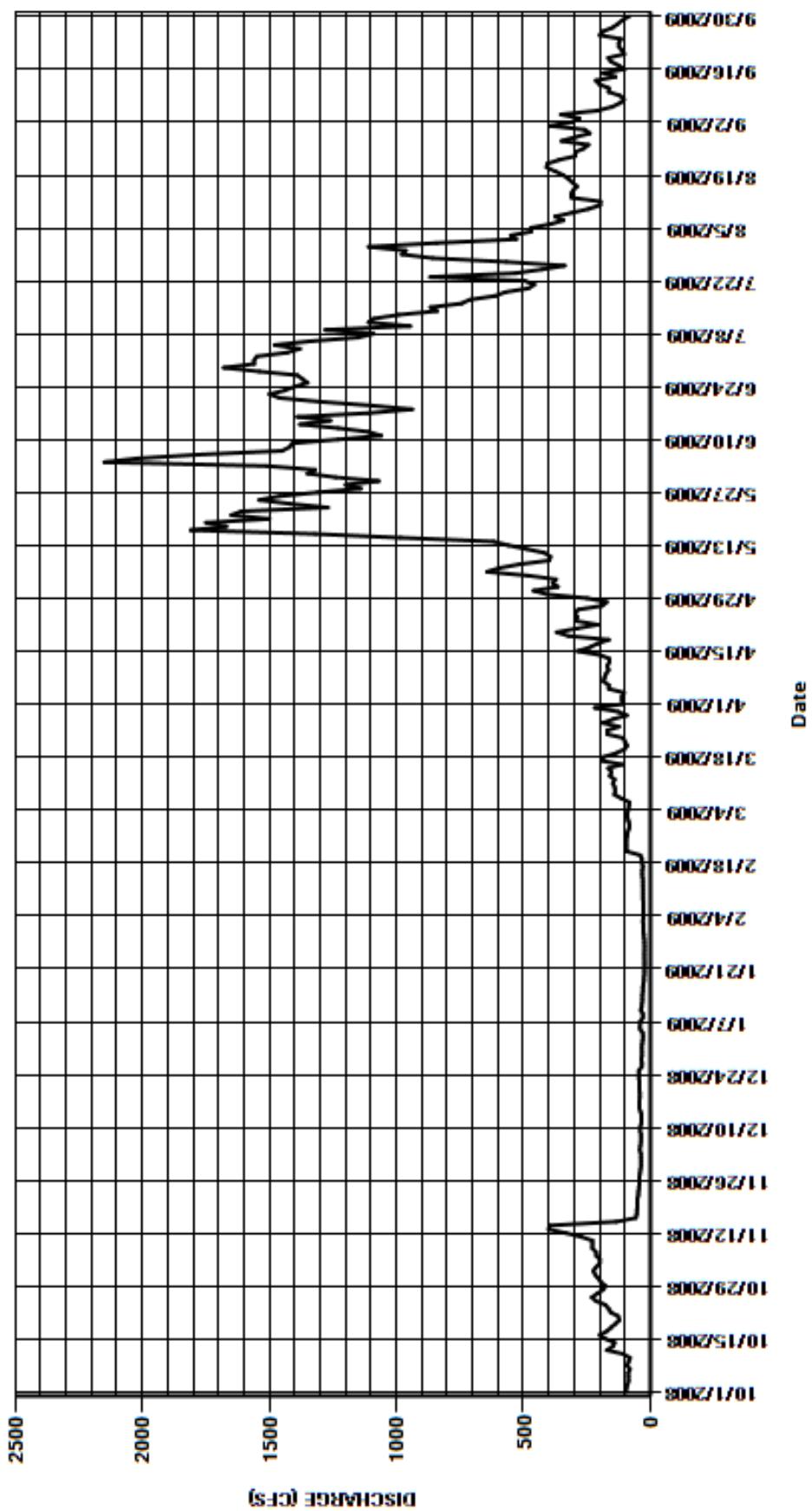
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	96	218	37	33	28	87	107	460	1350	1560	842	395
2	95	225	38	31	29	91	112	365	1320	1550	528	308
3	90	214	38	29	29	91	112	385	1510	1430	550	279
4	86	200	42	31	28	88	104	372	2150	1380	470	353
5	87	199	40	41	28	85	164	483	2020	1480	471	211
6	88	213	38	41	27	83	164	643	1780	1340	394	152
7	81	214	37	40	28	113	185	594	1450	1150	342	120
8	92	229	37	30	29	142	181	514	1420	1090	376	104
9	86	228	41	30	29	139	175	398	1410	1280	309	120
10	81	228	40	38	29	141	165	394	1230	946	244	165
11	107	272	37	34	29	148	171	417	1060	1110	198	164
12	172	332	36	33	30	141	163	487	1110	1090	197	202
13	148	401	35	32	30	160	162	560	1230	991	311	215
14	141	397	38	32	31	153	200	617	1380	840	313	137
15	177	135	44	30	33	166	287	984	1260	866	304	186
16	200	58	43	30	32	112	238	1320	1390	743	289	102
17	172	54	43	28	30	194	208	1810	1110	711	307	126
18	155	53	42	25	33	185	164	1670	938	611	323	156
19	138	52	42	25	34	135	322	1750	1100	572	345	166
20	122	51	43	24	40	103	369	1500	1300	481	376	103
21	127	52	43	24	93	92	289	1650	1460	457	409	112
22	156	48	44	23	95	101	208	1610	1500	496	406	125
23	165	47	45	23	95	106	296	1270	1440	867	359	125
24	177	45	45	24	95	170	288	1420	1400	532	296	116
25	214	44	46	24	93	171	297	1540	1350	428	297	200
26	231	44	34	23	90	124	284	1460	1370	338	263	187
27	209	43	34	23	85	188	190	1310	1390	567	244	149
28	187	41	36	24	82	147	172	1140	1540	858	350	128
29	177	39	33	25	---	93	250	1200	1680	979	296	110
30	195	37	33	26	---	128	405	1070	1560	963	239	83
31	205	---	34	29	---	219	---	1240	---	1110	259	---
TOTAL	4457	4413	1218	905	1334	4096	6432	30633	42208	28816	10907	5099
MEAN	144	147	39.3	29.2	47.6	132	214	988	1407	930	352	170
AC-FT	8840	8750	2420	1800	2650	8120	12760	60760	83720	57160	21630	10110
MAX	231	401	46	41	95	219	405	1810	2150	1560	842	395
MIN	81	37	33	23	27	83	104	365	938	338	197	83

CAL YR	2008	TOTAL	175748	MEAN	480	MAX	2300	MIN	20	AC-FT	348600
WTR YR	2009	TOTAL	140518	MEAN	385	MAX	2150	MIN	23	AC-FT	278700

MAX DISCH: 2240 CFS AT 06:15 ON Jun. 04,2009 GH 3.96 FT. SHIFT -0.1 FT.
 MAX GH: 3.96 FT. AT 06:15 ON Jun. 04,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER NEAR ROCKY FORD
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07122400 CROOKED ARROYO NEAR SWINK, CO
Water Year 2009

Location.-- Lat. 37°58'56", Long. 103°35'52", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, T.24 S., R.55 W., Otero County, on right bank 54 ft. downstream from bridge on State Highway 10, 2.0 mi. upstream from mouth, and 2.8 mi. southeast of Swink.

Drainage and Period of Record.-- 108 mi².

Equipment.-- High data rate Sutron 8210 DCP and Sutron Constant Flow Bubbler installed in a 4' x 4' steel shelter. Primary reference gage is a staff gage. No changes were made this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP log data with transmitted data as backup. Record is complete and reliable, except for the following periods: approximately November 26, 2008 – April 23, 2009, due to a beaver dam downstream creating backwater at the gage thereby affecting the stage-discharge relationship. On April 23, 2009, a contractor removed the beaver dam from the channel and cleared vegetation along the banks in the vicinity of the dam which was constricting flow.

Datum Corrections.-- Levels were last run August 22, 2008. No corrections were made.

Rating.-- The control is a sand, gravel, clay, and mud channel with earthen banks. Bank vegetation of variable density affects medium to high flows considerably. During low flow periods in the winter months considerable moss/algae growth appears in the channel bottom affecting the stage-discharge relationship. Rating No. 7 was used the entire water year. It is well defined to approximately 100 cfs. Twelve discharge measurements (Nos. 251-262) were made this water year ranging in discharge from 2.95 to 44.3 cfs. The peak flow of 303 cfs occurred at 1100 on Oct 12, 2008 at a gage-height of 5.90 feet with a shift of -0.13 ft. It exceeded the highest discharge measurement (No. 261) made June 6, 2008, by 3.07 feet in stage.

Discharge.-- Shifting control method used all year. Shifts were distributed by time proration from Oct 1 2008 to November 25, 2008, and from April 24 2009 to the end of the water year. Shifts were distributed by stage using shift curve SC09A from November 26, 2008 to April 23, 2009. Open water measurements showed shifts ranging from -0.06 to -0.21 ft. Shifts were applied directly and given full weight except for measurements 251, 252, 258, and 262, which were discounted from -1 to -8% to smooth shift distribution.

Special Computations.-- During the period November 26, 2008 to April 23, 2009, a beaver dam caused backwater on the gage affecting the stage-discharge relationship. This effect was accounted for in the record through the use of a variable shift curve (SC09A) which shifted the gage height downward as the stage increased. A hydrograph was used in the analysis of the record.

Remarks.-- Record is fair, except during the period of backwater effect due to a downstream beaver dam, which is poor. Station maintained and record developed by Adam Adame.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07122400 CROOKED ARROYO NEAR SWINK, CO

RATING TABLE--

CANSWKCO07 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	15	6	4.3	4.7	3.8	24	15	21	24	39	19
2	18	12	6.2	4	4.7	3.9	4	25	33	22	46	22
3	11	16	5.7	3.6	4.7	4.3	4.3	32	44	23	33	10
4	11	29	5.5	4.1	4.5	3.8	4.3	28	35	18	19	11
5	8.7	38	5.2	4	3.6	3.4	6.9	15	28	30	20	19
6	17	23	5.2	4.2	3.6	3.2	6.8	15	24	37	14	7.5
7	12	15	5.1	4.5	6.1	3.4	4.8	24	23	31	14	8.4
8	18	14	5.2	3.9	13	4.1	3.9	17	30	35	14	6.8
9	15	25	5.1	4.3	5.9	6.2	4.9	18	17	34	17	5.1
10	15	20	5.1	4.2	3.7	4.6	3.9	21	32	20	19	4.8
11	23	21	6.1	4.2	3.3	4.2	3.9	16	43	22	22	4.6
12	88	18	9.8	4.5	3.4	4.3	7.9	13	31	18	16	4.5
13	50	21	7.5	4.6	3.6	3.7	11	12	28	17	13	4.4
14	27	34	5.1	4.5	3.7	3.8	5.6	10	30	16	14	4.3
15	32	39	4	4.1	3.7	4.5	4.2	10	34	13	11	5.6
16	42	4.8	3.5	4.1	3.9	12	9.7	17	37	11	11	6
17	38	4.1	3.7	3.7	3.9	6.9	12	15	42	12	13	5.8
18	29	4.3	3.6	3.5	3.7	4.6	8.4	21	33	12	10	8.5
19	25	3.8	3.9	3.2	3.6	5.1	11	18	16	16	25	14
20	28	4.4	4.6	3.2	3.7	4.3	7.8	13	9.9	14	24	15
21	45	5.7	3.2	3.2	4.4	4.6	7.7	18	19	14	25	14
22	43	5.7	3.1	3.1	5.1	3.9	3.9	41	17	12	16	19
23	44	7.2	3.1	4	5.6	8.6	10	38	13	11	14	24
24	24	7.9	3.1	4.5	3.7	5.7	28	36	16	15	13	17
25	20	7.2	3.2	4	4.3	4.9	15	43	12	16	9.4	13
26	16	6.5	3.3	4.5	4.3	6.2	20	37	20	40	18	16
27	23	6.5	3.7	4.5	4.2	21	22	40	20	48	12	21
28	23	6.5	3.7	4.6	3.7	21	26	51	20	55	17	20
29	17	6.4	3.7	4.7	---	13	28	44	22	52	28	26
30	9.3	6.1	4.1	4.7	---	10	13	28	21	21	21	23
31	10	---	4.2	4.6	---	14	---	21	---	37	8.1	---
TOTAL	807.0	427.1	144.5	127.1	126.3	207.0	322.9	752	770.9	746	575.5	379.3
MEAN	26	14.2	4.66	4.1	4.51	6.68	10.8	24.3	25.7	24.1	18.6	12.6
AC-FT	1600	847	287	252	251	411	640	1490	1530	1480	1140	752
MAX	88	39	9.8	4.7	13	21	28	51	44	55	46	26
MIN	8.7	3.8	3.1	3.1	3.3	3.2	3.9	10	9.9	11	8.1	4.3

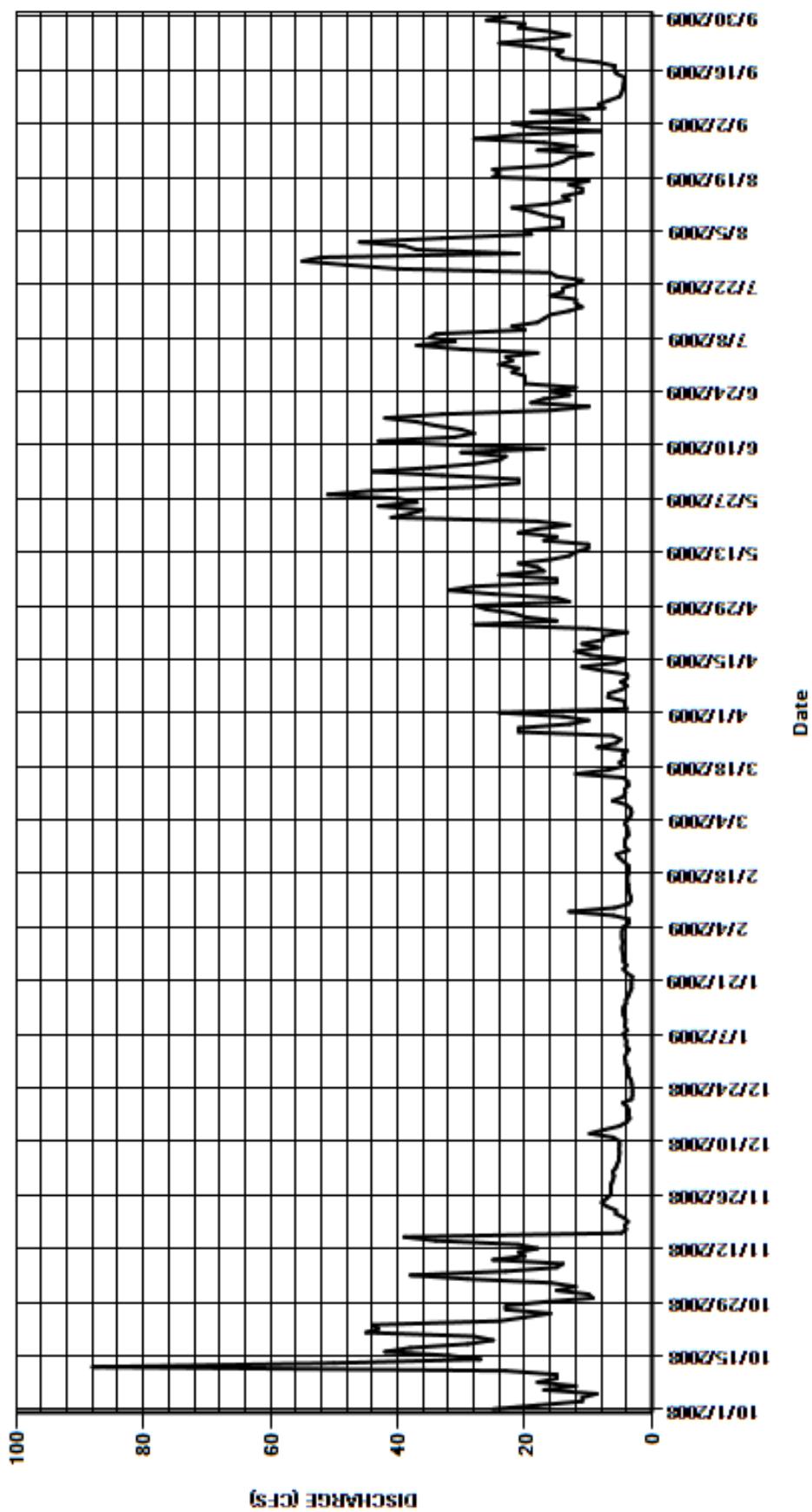
CAL YR	2008	TOTAL	6559.0	MEAN	17.9	MAX	88	MIN	3.1	AC-FT	13010
WTR YR	2009	TOTAL	5385.6	MEAN	14.8	MAX	88	MIN	3.1	AC-FT	10680

MAX DISCH: 303 CFS AT 11:00 ON Oct. 12,2008 GH 5.9 FT. SHIFT -0.13 FT.

MAX GH: 5.9 FT. AT 11:00 ON Oct. 12,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07122400 CROOKED ARROYO NEAR SWINK CO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07123000 ARKANSAS RIVER AT LA JUNTA
Water Year 2009

Location.-- Lat. 37°59'26", Long. 103°31'55", in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 2, T.24 S., R.55 W., Otero County, Hydrologic Unit 11020005, on right bank at upstream side of bridge on State Highway 109 in La Junta, 450 ft upstream from King Arroyo.

Drainage and Period of Record.-- 12,210 mi². Staff gage originally established by USGS in 1889, with sporadic data and various locations. Water stage recorder in use since Oct. 1933 at several locations also. Gage site in continuous use since then.

Equipment.-- Satellite-monitored data collection platform (high data rate Sutron 8210 DCP) and Sutron Constant Flow Bubbler in 4' x 4' steel shelter. A wire-weight gage on the Hwy 109 Bridge serves as the primary reference gage. A staff gage mounted on the southern Hwy 109 bridge pier is used as a supplemental gage. The purpose of the staff gage is to allow emergency management personnel to monitor the river stage continuously during flood events. The Constant Flow Bubbler was replaced because of a leak on Sep 24, 2009.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP log data with satellite data and CFB log used as backup. Record is complete and reliable, except for: Dec 14-17, 20-25, 2008, Jan 26-30, 2009, when ice affected the stage-discharge relationship; and, Aug 29-31, and Sep 1-24 when the Constant Flow Bubbler had a leak.

Datum Corrections.-- Levels were last run on Oct. 4, 2007 using RM No. 2 as base. No corrections were made.

Rating.-- Shifting sand channel is the primary control at low stages with bridge piers, abutments, heavily vegetated banks and islands contributing at medium flows and above. At high flows (flooding stage) river will flow out of bank on the north side approximately 150 to 200 feet upstream of the gage. Rating No. 42, in use since October 1, 2008, was used during the entire water year. Eighteen discharge measurements (Nos. 1125-1142), ranging in discharge from 30.1 to 1200 cfs, were made during the water year. They cover the range in stage experienced except for the lower daily flows of Mar 21,22, 2009 and the high daily flows of Jun, 4, 5 2009. The peak discharge of 1380 cfs occurred at 0900 May 22, 2009 at a gage height of 9.36 ft with a shift of 0.27 ft. It exceeded the stage of high flow measurement No. 1137 by 0.38 ft.

Discharge.-- Shifting control method used all year. Shifts were applied as defined by measurements and distributed by both time and stage. Shifts were distributed by time proration from Oct 1 2008 until 1500 April 9, 2009, and from 1300 August 7, 2009 until the end of the water year. Shifts were distributed by stage using two variable stage-shift relations: SC09A, used from 1600 Apr 9, 2009 until 0800 May 22, 2009, and, SC09B used from 0900 May 22, 2009 until 1224 Aug 7, 2009. Water Year 2009 measurements showed shifts ranging from -0.13 to +0.36 ft. Measurement Nos. 1134, 1138, and 1139 were discounted from -4% to +3%. to smooth shift distribution.

Special Computations.-- A hydrograph was used and daily average flows were compared to upstream and downstream gages. Rapid increases/decreases in gage height observed at the gage during the irrigation season can be due to the effects of Ft. Lyon Canal gate changes and sluice gate operations, both of which are within three miles upstream of the gage. Partial day good data were used to estimate daily flows during the period when the CFB had a leak.

Remarks.-- The record is fair due to the dynamic nature of the sand channel. Periods of ice-affected gage height and when the CFB had a leak should be considered poor. Station maintained and record developed by Adam Adame .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07123000 ARKANSAS RIVER AT LA JUNTA

RATING TABLE--

ARKLAJCO42 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	65	39	113	70	58	115	110	436	686	703	119	110
2	64	36	111	71	56	115	45	377	688	657	240	125
3	53	37	113	69	55	113	42	389	609	570	421	70
4	45	44	108	65	56	115	43	370	1220	456	384	75
5	42	52	105	66	57	109	47	420	1220	687	327	130
6	61	49	100	67	56	105	49	555	1130	580	275	70
7	43	46	97	66	59	116	36	547	655	660	198	58
8	46	47	98	65	63	157	33	541	637	282	217	35
9	42	55	100	63	63	184	40	450	618	485	199	34
10	43	55	91	60	59	188	36	399	478	421	151	60
11	86	51	94	62	59	195	38	410	357	523	102	55
12	214	51	101	63	60	201	50	465	322	522	59	70
13	88	55	99	61	59	196	58	519	443	516	60	85
14	64	59	90	63	59	195	46	560	506	487	104	80
15	62	385	70	61	61	79	39	615	630	498	73	80
16	67	204	85	60	62	49	49	534	527	479	63	80
17	61	154	90	60	63	55	57	962	519	432	59	80
18	57	136	90	59	63	56	50	993	268	362	60	80
19	54	115	92	59	61	43	54	1060	281	308	373	80
20	55	111	80	57	60	31	52	896	412	280	189	80
21	63	107	85	58	82	26	52	864	570	324	187	85
22	58	108	80	58	108	27	43	1080	666	333	159	92
23	54	113	78	57	113	35	41	647	606	448	141	95
24	45	110	75	56	113	34	50	671	627	417	86	100
25	43	109	75	56	117	33	100	903	556	303	71	141
26	39	108	79	55	118	34	150	878	582	289	70	183
27	42	110	72	50	118	152	132	705	487	198	66	161
28	42	113	70	50	121	354	144	660	576	209	89	143
29	40	112	72	55	---	246	174	629	820	457	140	133
30	38	110	70	55	---	72	308	522	785	343	90	111
31	36	---	67	60	---	141	---	586	---	275	60	---
TOTAL	1812	2881	2750	1877	2079	3571	2168	19643	18481	13504	4832	2781
MEAN	58.5	96	88.7	60.5	74.2	115	72.3	634	616	436	156	92.7
AC-FT	3590	5710	5450	3720	4120	7080	4300	38960	36660	26790	9580	5520
MAX	214	385	113	71	121	354	308	1080	1220	703	421	183
MIN	36	36	67	50	55	26	33	370	268	198	59	34

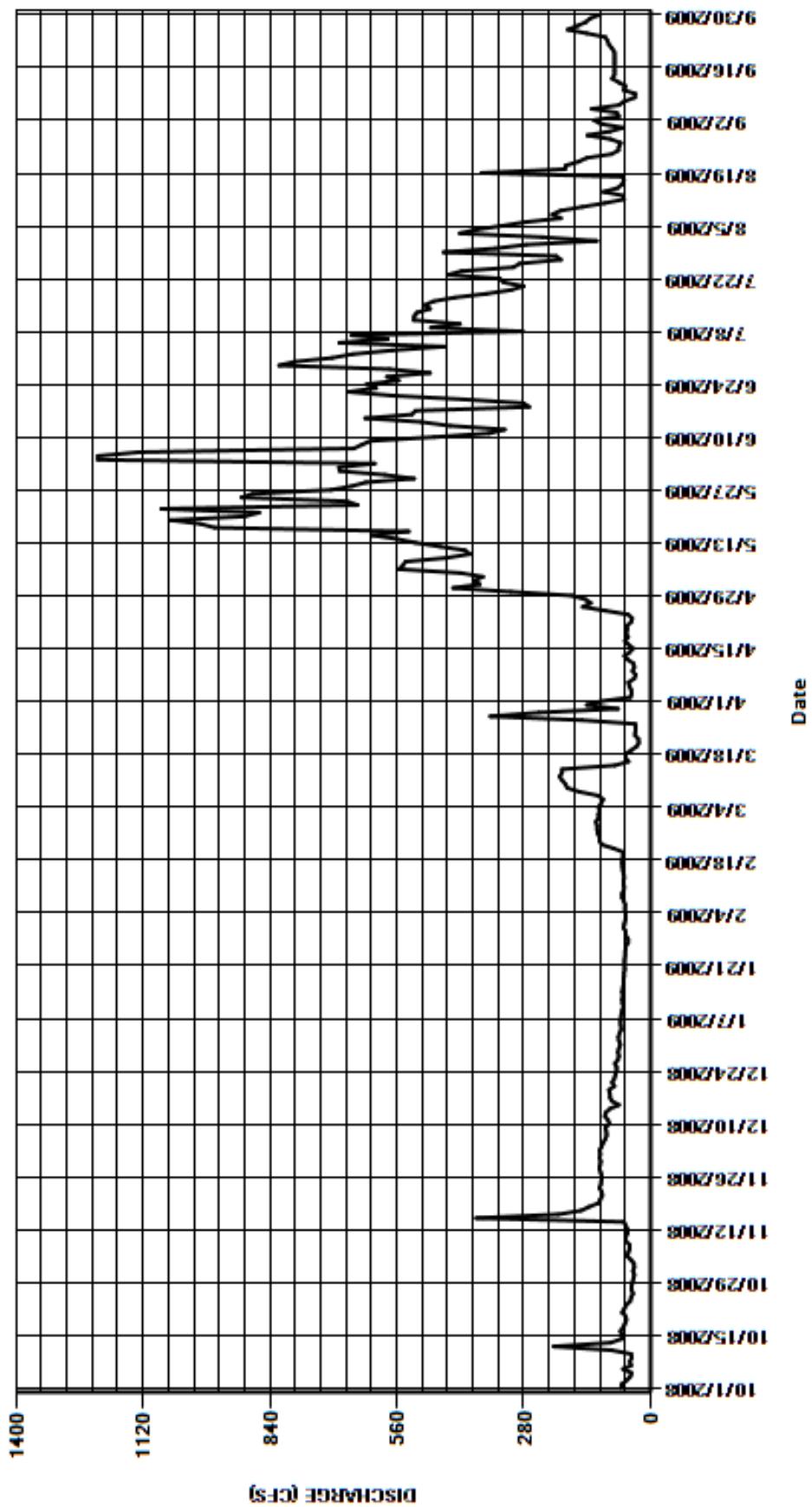
CAL YR	2008	TOTAL	98636	MEAN	269	MAX	1200	MIN	36	AC-FT	195600
WTR YR	2009	TOTAL	76379	MEAN	209	MAX	1220	MIN	26	AC-FT	151500

MAX DISCH: 1380 CFS AT 09:00 ON May. 22,2009 GH 9.36 FT. SHIFT 0.27 FT.

MAX GH: 9.36 FT. AT 09:00 ON May. 22,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**07123000 ARKANSAS RIVER AT LA JUNTA
WY2009 HYDROGRAPH**



ARKANSAS RIVER BASIN
HORSE CREEK AT HIGHWAY 194
Water Year 2009

Location.-- Lat. $38^{\circ}05'06''$, Long. $103^{\circ}21'12''$, in SE1/4, SW1/4, sec. 33, T.22S., R.53 W., Bent County, Hydrological Unit 11020008, on right bank 15 ft upstream from right end of box culverts on State Highway 194, 3.2 mi upstream from mouth, 3.4 mi downstream from Ft. Lyon Canal Aqueduct, and 7.5 mi west of Las Animas, Co.

Drainage and Period of Record.-- 1403 sq.mi. Established and operated Oct. 19, 1979 to Sep. 30, 1993 by USGS. Operated and maintained by State of Colorado Oct. 1, 1993 to present.

Equipment.-- Sutron Constant Flow Bubbler (CFB) and high data rate satellite-monitored data collection platform (Sutron 8210 DCP) in a 4' x 4' steel shelter. Primary reference gage is a staff gage on the right side of the channel just upstream of the concrete weir control. A Texas Electronics Series 525 precipitation gage is operated at the site. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable.

Datum Corrections.-- Levels were last run on October 4, 2007.

Rating.-- The existing 2-stage weir control was installed in April 2005. A stainless steel Cipolletti weir controls the low flows up to approximately 13.5 cfs. The medium flows are controlled by the second stage of the compound weir with flows up to 80.9 cfs. The high flows are controlled by the box culverts under Highway 194 and bank vegetation. There is a fence and drop structure on Horse Creek on the downstream side of Hwy 194. Weeds and debris can collect on the fence and cause the gage control structure to become submerged. When visiting this gage, care needs to be taken to ensure that the downstream fence is clear. Rating No. 7 was developed during WY2005 based on the design and installation of the new compound control. Seven discharge measurements (Nos. 288-294) were made during the water year, ranging in discharge from 4.03 to 37.1 cfs. The peak flow of 49.6 cfs occurred at 0715 on Aug 1, 2009 at a gage height of 1.50 ft with a shift of 0.16 ft.

Discharge.-- Measurements have shown that shifts are clearly a function of gage height associated with the compound weir. Shifts were adjusted to zero when gage heights are well below the crest of the Cipolletti Weir (about 0.80 ft), but are positive when gage heights are above the Cipolletti Weir and into the 2nd stage. Variable stage-shift relationship, SC09B, was used for the water year. For lower flow measurements, where flow is controlled by the Cipolletti weir, shifts were adjusted to 0.00 ft. Some of the percentages are large (7.37%) but were percentage to the shift curve based on the poor to fair quality of the measurements. The creek has a soft bottom leading to errors in depth readings. Often moss prevents good velocity readings as well. Past history and the scatter of measurements about a zero shift seem to indicate that the Cipolletti weir is following the theoretical rating. However, for higher flow measurements (Nos. 292 and 293) where flows are controlled by the 2nd stage weir, larger shifts were observed and used in the upper end of variable shift curve SC09B.

Special Computations.--

Remarks.-- Record is good. Station maintained and record developed by Adam Adame .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HORSE CREEK AT HIGHWAY 194

RATING TABLE--

HRC194CO07 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.1	13	5	4.3	3.7	3.5	5.5	7.4	24	17	48	4.3
2	4.1	24	5.1	4.4	3.8	3.5	5.4	7.4	28	8.1	39	4.1
3	4.1	17	5	4.4	3.7	3.6	11	7.8	34	11	23	5.1
4	4.2	7.5	5	4.3	3.8	3.6	20	8.6	25	24	21	20
5	4	8.3	4.9	4.3	3.9	3.5	16	8.9	9.9	25	20	20
6	4.7	6.7	4.8	4.3	4.1	3.5	6.4	7.8	9	12	21	6.3
7	6.9	6.1	4.8	4.3	4	3.5	5.5	7.9	16	9.2	12	5.4
8	6.5	6.1	4.9	4.3	4.1	3.4	5	26	28	8.6	11	4.8
9	22	6.1	4.9	4.3	4.4	3.4	4.9	26	24	15	10	4.3
10	23	6.1	4.7	4.1	4.5	3.4	4.7	11	13	21	10	4.1
11	8.3	6	4.8	4.1	4.3	3.3	4.6	9.4	14	19	24	4
12	25	13	4.9	4.1	4.2	3.3	4.8	8.3	16	13	26	4
13	21	23	5	4.1	4.1	3.3	5.3	7.1	8.9	8.9	11	4
14	10	17	4.7	4.1	4.1	3.4	11	14	15	7.2	7.7	3.8
15	10	7.3	4.6	4.1	3.9	3.4	23	26	29	5.9	6.5	3.6
16	8.9	7.7	4.7	4.1	3.9	6.4	18	20	26	5.1	5.7	3.7
17	7.7	6.4	4.6	4.1	3.9	3.8	7	8.6	12	4.5	5.3	3.8
18	7.1	6.2	4.5	4.1	3.9	3.9	6.4	7.7	15	4.5	5.1	3.8
19	6.7	6	4.4	4.1	3.8	3.9	6.2	6.4	22	19	6.4	19
20	6.4	5.8	4.4	4.1	3.8	3.9	6.8	5.9	37	23	20	22
21	6.3	5.9	4.4	4.1	3.7	3.8	5.9	13	33	7.8	20	14
22	5.9	5.8	4.4	4.1	3.7	3.9	5.9	26	18	5.4	6.3	17
23	7.2	5.8	4.2	4.1	3.7	3.9	13	21	10	5.2	5.2	20
24	23	5.6	4.1	4.1	3.7	3.8	26	10	8.6	5.6	4.5	23
25	23	5.7	4.1	4.1	3.7	4.1	19	8.7	13	5.1	4.4	24
26	7.8	5.6	4.3	4.2	3.7	3.8	8.3	7.8	12	5.5	4.6	12
27	6.4	5.4	4.3	4.1	3.7	4.3	7.8	16	8	26	8.4	7.7
28	6.2	5.4	4.3	4	3.5	3.7	7.6	25	9.6	31	6.1	6.8
29	6.1	5.4	4.3	3.8	---	4.2	7.9	18	16	11	5.2	6.3
30	6	5.2	4.3	3.7	---	5.4	7.6	7.4	23	20	4.7	5.9
31	5.8	---	4.3	3.7	---	5.6	---	13	---	34	4.4	---
TOTAL	298.4	255.1	142.7	128.0	109.3	120.0	286.5	398.1	557.0	417.6	406.5	286.8
MEAN	9.63	8.5	4.6	4.13	3.9	3.87	9.55	12.8	18.6	13.5	13.1	9.56
AC-FT	592	506	283	254	217	238	568	790	1100	828	806	569
MAX	25	24	5.1	4.4	4.5	6.4	26	26	37	34	48	24
MIN	4	5.2	4.1	3.7	3.5	3.3	4.6	5.9	8	4.5	4.4	3.6

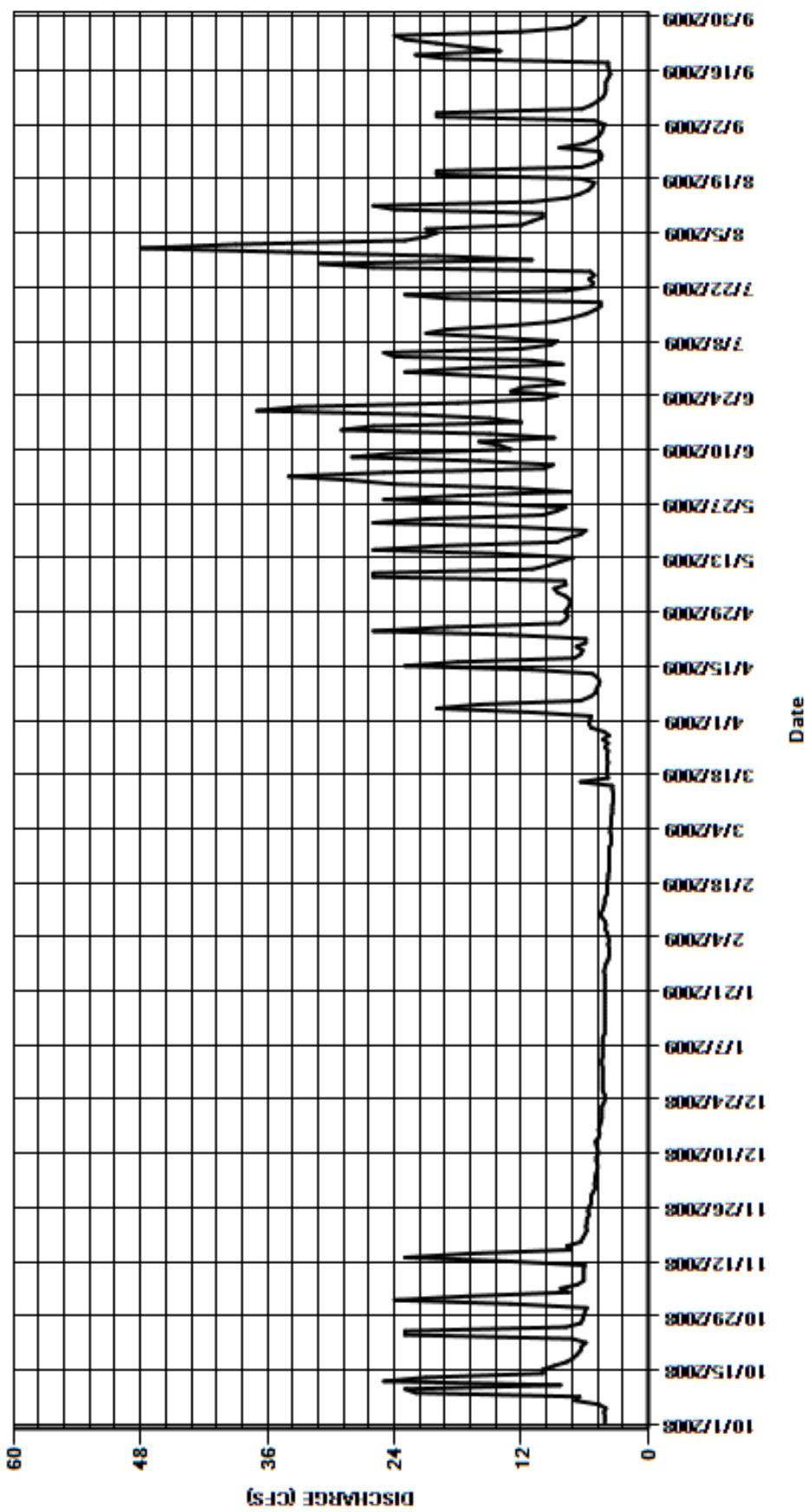
CAL YR	2008	TOTAL	3093.3	MEAN	8.45	MAX	33	MIN	2.5	AC-FT	6140
WTR YR	2009	TOTAL	3406.0	MEAN	9.33	MAX	48	MIN	3.3	AC-FT	6760

MAX DISCH: 50 CFS AT 07:15 ON Aug. 01,2009 GH 1.5 FT. SHIFT 0.16 FT.

MAX GH: 1.5 FT. AT 07:15 ON Aug. 01,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HORSE CREEK AT HIGHWAY 194
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
RATON CREEK ABOVE STARKVILLE, CO
Water Year 2009

Location.--	Lat. 37°07'35.5", Long. 104°31'24.8" in NW¼, NE¼, NE½, Section 35, T33S, R64W, Las Animas County, 20 feet away from the creek on the left upstream side of bridge for road 18.3 approximately half a mile south of Interstate 25 exit 8 south of Trinidad.
Drainage and Period of Record.--	54.49 sq.mi.
Equipment.--	Sutron SatLink data collection platform (DCP), with High Data Rate (HDR) radio and shaft encoder. The data logger is housed inside a 4 ft x 4 ft metal shelter about 20 feet from the creek, while the shaft encoder is in a 20" x 30" metal "half" shelter atop an 18" corrugated metal pipe stilling well attached to the left wing wall on the upstream side of the bridge. A Texas Instruments rain gage model TR-525USW is mounted on the antenna mast. Shaft encoder is set to an electric drop tape inside the half shelter. The rain gage was replaced due to problems with the tipping bucket. No other changes this water year.
Hydrographic Conditions.--	The gage is situated in a valley at the town of Starkville approximately two miles above the Purgatoire at Trinidad gage. The gage is subject to flash flooding from the higher mountainous area above the gage with several smaller tributary streams. The channel is contained on the left side by railroad tracks set higher and a sheer wall several feet higher, the right side is contained by the county road for about a hundred feet and then the valley wall.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with the DCP log as backup. The record is complete and reliable, except for the following periods: November 15, 30, December 1, 5, 9, 10, 14 - 16, 19 - 24, 27, 28, 31, 2008, January 4 - 21, 24 - 31, February 1 - 5, 12 - 16, 18 - 22, 28, March 1, 2, 12 - 16, 26, 29, 30, April 5, 6, 2009, when ice in the creek and/or well affected the stage-discharge relationship; and, March 27, 28, 2009, when the well was frozen.
Datum Corrections.--	No levels were run this year. Previous levels were run September 18, 2007. No corrections were needed.
Rating.--	The control at low flows up to 10 cfs is a gravel riffle in the creek channel. Control at medium to high stage includes the riverbanks and brush lining the edges of the channel as well as the bridge abutments. Extreme high flows can go out of the channel on the right bank into an area upstream and extending approximately 30 feet south of the bridge and on the left bank 30 feet to the north which is at a slightly lower elevation than the gage. The extreme high flow would bypass the gage on the left side. Changes in shift are due to channel work under the bridge immediately below the gage. Gravel and material are periodically "pushed" in by the landowner below the gage to keep the flow channeled to the right side. Other changes in shift are due to a small diversion dam that has deteriorated and moved downstream. These cause material to "back up" and wash out. Control change was noted on the visits made December 18, 2008, June 1, and 15, 2009. The land owner has been asked to not "help" control the flow of Raton Creek. Rating No. 1, dated July 8, 2003, was used for the entire water year. Rating No. 1 is well defined to about 40 cfs. The upper end of the rating curve was developed based on channel surveys and computer modeling. Twelve discharge measurements (Nos. 96 - 108) were made during water year. Measurements ranged in discharge from 0.00 to 2.33 cfs. They cover the range in stage experienced during the period of record, except for the higher daily flows of October 11, 2008; April 13 - 16, 18 - 21; May 21, 2009. The peak discharge of 1320 cfs occurred at 1645 on October 11, 2008 at a gage height of 6.83 ft with a shift of -0.79 ft. It exceeded measurement No 100, made April 24, 2009 by 4.24 feet in stage.
Discharge.--	Shifts were applied as defined by measurements and were distributed by time from 0000 October 1, 2008 through the end of the water year, except for the high flow event/peak on October 11, 2008, when shifts were distributed by stage. Open water measurements indicated shifts varying from -0.79 ft to +0.34 ft. All open water measurements were given full weight and applied directly.
Special Computations.--	Temperature record from Trinidad, and hydrographic comparison with the Purgatoire River at Trinidad gage, along with measurements 97 - 99 were used for estimating flows during periods of ice effect. Periods of zero flow were verified by observation visits nos. 96 (which was made at the end of water year 2008), 104, 107 - 109.
Remarks.--	Record is good, except for periods when the gage height is less than 1.50 ft and greater than 3.08 feet, during which time the record should be considered fair to poor due to lack of rating definition at high flows and changing control condition at low flows; and during periods of ice effect, which should be considered poor. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RATON CREEK ABOVE STARKVILLE, CO

RATING TABLE--

RACRSTCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

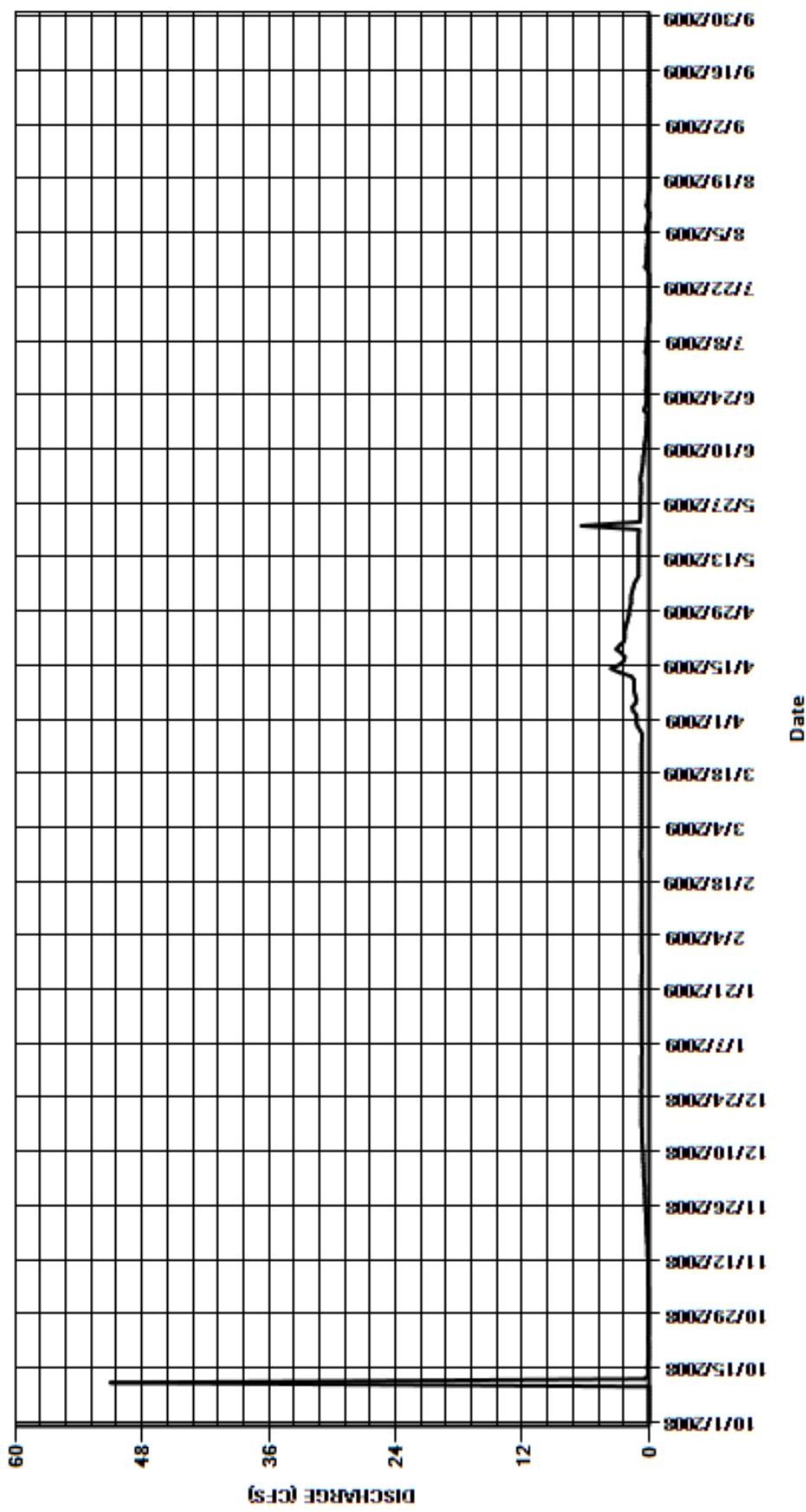
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0.07	0.42	0.72	0.7	0.72	1.2	1.7	0.78	0.21	0.23	0
2	0	0.07	0.48	0.72	0.72	0.73	1.2	1.7	0.83	0.19	0.17	0
3	0	0.07	0.5	0.73	0.7	0.72	1.5	1.7	0.77	0.19	0.14	0
4	0	0.07	0.5	0.7	0.7	0.73	1.6	1.6	0.71	0.19	0.09	0
5	0	0.08	0.5	0.68	0.7	0.73	1.3	1.5	0.65	0.35	0.18	0.01
6	0	0.09	0.54	0.7	0.72	0.73	1.2	1.4	0.6	0.26	0.3	0
7	0	0.09	0.55	0.7	0.72	0.73	1.3	1.2	0.55	0.24	0.18	0
8	0	0.09	0.58	0.7	0.72	0.73	1.4	1	0.55	0.2	0.09	0
9	0	0.09	0.56	0.7	0.73	0.73	1.4	1	0.48	0.18	0	0
10	0	0.1	0.58	0.7	0.72	0.73	1.4	1	0.45	0.15	0	0
11	51	0.11	0.63	0.7	0.72	0.73	1.4	1	0.45	0.15	0.13	0
12	0.4	0.12	0.65	0.7	0.7	0.72	1.7	1	0.37	0.11	0.25	0.05
13	0.11	0.14	0.68	0.72	0.7	0.73	2.8	0.99	0.33	0.02	0.15	0.01
14	0.12	0.16	0.68	0.72	0.7	0.73	3.6	0.99	0.29	0	0.12	0
15	0.15	0.14	0.68	0.72	0.7	0.73	2.8	0.99	0.29	0	0.07	0
16	0.12	0.18	0.7	0.7	0.72	0.73	2.4	0.99	0.24	0.02	0	0
17	0.07	0.2	0.73	0.7	0.73	0.73	2.3	0.99	0.22	0	0	0
18	0.05	0.22	0.74	0.7	0.7	0.73	2.6	0.98	0.21	0	0	0
19	0.05	0.24	0.72	0.7	0.7	0.72	3.1	0.98	0.2	0	0	0
20	0.05	0.26	0.72	0.72	0.7	0.73	2.8	0.97	0.5	0	0	0
21	0.07	0.27	0.72	0.7	0.7	0.73	2.4	6.4	0.33	0	0	0
22	0.08	0.29	0.72	0.74	0.7	0.73	2.3	0.89	0.27	0	0	0
23	0.08	0.31	0.72	0.72	0.73	0.72	2.3	0.84	0.25	0	0	0
24	0.07	0.32	0.72	0.7	0.74	0.72	2.3	0.83	0.26	0	0	0
25	0.07	0.34	0.74	0.7	0.74	0.72	2.2	0.82	0.33	0	0	0
26	0.07	0.36	0.74	0.68	0.74	0.7	2.1	0.82	0.25	0.13	0	0
27	0.07	0.38	0.7	0.68	0.73	0.65	2	0.82	0.23	0.38	0	0
28	0.07	0.4	0.7	0.68	0.72	0.65	1.9	0.81	0.24	0.28	0	0
29	0.07	0.42	0.73	0.68	---	0.85	1.9	0.79	0.22	0.25	0	0
30	0.07	0.4	0.73	0.7	---	1.1	1.8	0.78	0.25	0.24	0	0
31	0.07	---	0.7	0.7	---	1.2	---	0.77	---	0.21	0	---
TOTAL	52.91	6.08	20.06	21.81	20.00	23.33	60.2	38.25	12.10	3.95	2.10	0.07
MEAN	1.71	0.2	0.65	0.7	0.71	0.75	2.01	1.23	0.4	0.13	0.068	0.002
AC-FT	105	12	40	43	40	46	119	76	24	7.8	4.2	0.1
MAX	51	0.42	0.74	0.74	0.74	1.2	3.6	6.4	0.83	0.38	0.3	0.05
MIN	0	0.07	0.42	0.68	0.7	0.65	1.2	0.77	0.2	0	0	0
CAL YR	2008	TOTAL	231.88	MEAN	0.63	MAX	51	MIN	0	AC-FT	460	
WTR YR	2009	TOTAL	260.86	MEAN	0.71	MAX	51	MIN	0	AC-FT	517	

MAX DISCH: 1320 CFS AT 16:45 ON Oct. 11,2008 GH 6.83 FT. SHIFT -0.79 FT.

MAX GH: 6.83 FT. AT 16:45 ON Oct. 11,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RATON CREEK ABOVE STARKVILLE, CO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
07124500 PURGATOIRE RIVER AT TRINIDAD
Water Year 2009

Location.--	Lat. 37°10'21", Long. 104°30'27", in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T.33 S., R.64 W., Las Animas County, in city of Trinidad, on left bank. This is at the west end of the Commercial Street Bridge 20 feet upstream.
Drainage and Period of Record.--	795 mi ² .
Equipment.--	Sutron 8210 High Data Rate DCP (satellite monitored data collection platform) connected to a Sutron Constant Flow Bubbler (CFB) inside a 4 ft x 4 ft steel shelter on the left bank above the main channel. The CFB is connected to an orifice line inside a 1-½ inch galvanized pipe, which is anchored to the bank extending down and into the channel. The primary reference is a wire weight gage installed on the Commercial Street Bridge immediately downstream and in line with the orifice line and staff gage set in the streambed near the orifice. No changes were made this year.
Hydrographic Conditions.--	The gage is located in the city of Trinidad approximately 3.5 miles downstream of the Trinidad Lake Reservoir and 2.65 miles downstream from the confluence with Raton Creek. It is on a fairly straight section of channel above and below the gage at an elevation of 5992 feet above MSL, with a drainage area of 795 sq.mi. The left side of the channel consists of gravel and small cobble at the orifice pool with the right side having heavy vegetation consisting of grass to trees above and below the bridge. The regulation of Trinidad reservoir greatly influences the flow at the gage in town, while Raton Creek is subject to flash flooding. A small amount of irrigation is above the gage as well as the intake pipes for the city of Trinidad water supply. Urban runoff can affect the gage.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP and CFB data logs used for backup purposes. Record is complete and reliable, except for the following periods: Dec 5, 8 – 16, 21, 22, 27, 2008, Jan 4 – 6, 10 – 19, 26 – 31, Feb 1 – 5, 13, 14, 18, 19, 28, Mar 1, 2, 13, 14, 27 – 29, Apr 2, 5, 2009, when ice at or near the gage affected the gage height. During the period December 18 – 20, 2008, CFB log data were used due to DCP failure without loss of accuracy.
Datum Corrections.--	No levels were run this water year. Levels were run previously June 21, 2007. No corrections were needed.
Rating.--	The river channel consists of gravel to small cobble from the reservoir down to a diversion dam 500 feet below the gage. The control for low flows is a gravel riffle below the gage under the bridge. Medium flows of up to 400 – 500 cfs are controlled by the channel, with dense vegetation on either side, or the center pier of the bridge. High flows are confined on the right bank by a stone and masonry wall which changes to a three foot high "river walk" wall on the right across from the gage and under the bridge and on the left bank by a gunite and rock wall to an elevation of about 11 feet (9000 cfs by USGS extension). Discharge of up to 9000 cfs can be contained under the Commercial Street Bridge, with higher flow coming out of bank and flooding the area immediately next to the river including the railroad tracks less than 40 feet from the river. Rating 28 was used the entire water year. Thirteen measurements (Nos. 1263 – 1275) were made during the water year and ranged from 1.66 to 232 cfs. They cover the range in stage except for the lower daily flows on October 30; Nov 1 – 30; December 1 – 12, 15 – 17, 19 – 21, 23 – 31, 2008; January 1 – 30; February 1 – 16, 18, 25, 28; March 1, 3 – 27, 2009, and the higher daily flows of May 15 – 21, 26, 27; July 29, 2009. The peak discharge of 787 cfs occurred at 1830 on October 11, 2008 at a gage height 3.87 ft with a shift of -0.06 ft. It exceeded measurement No. 1268 made May 11, 2009 by 1.05 feet in stage.
Discharge.--	Shifting control method was used all year. Shifts were applied as defined by measurements and were distributed by time and event for the period from October 1, 2008 thru 1445 April 3, 2009 and from 1200 September 18, 2009 through the end of the water year. Two shift curves were used, PURTRICOSC01, was used from 1500 April 3 through 1415 May 17 and PURTRICOSC02 from 1500 May 17 through 1155 September 18, 2009. All measurements were made in open channel and were given full weight with the exception of Nos. 1271 and 1274; which were discounted from 2% to 3% for smoothing purposes. Measurements this year showed shifts ranging from -0.11 feet to -0.06 feet.
Special Computations.--	The peak discharge of October 11, 2008, was the result of a rain event above the Raton Creek above Starkville gage. Ice period flows were estimated using measurements 1265 and 1266 (both made during periods of ice-affected gage heights), a hydrograph, and temperature data from the Trinidad weather station.
Remarks.--	Record is good, except during periods of ice affected gage height record, which are estimated and poor. Winter releases from Trinidad Reservoir often help reduce the amount of ice in the channel. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	Shifts have continued to become more negative since Water Year 2008, possibly due to the I-25 bridge construction upstream of the gage and sediment/small debris aggradation in the vicinity of the gage. At higher gage heights shifts are even more negative. The consistency of measured shifts from March 2008 to present indicates a modification to Rating 28 is needed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07124500 PURGATOIRE RIVER AT TRINIDAD

RATING TABLE--

PURTRICO28 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

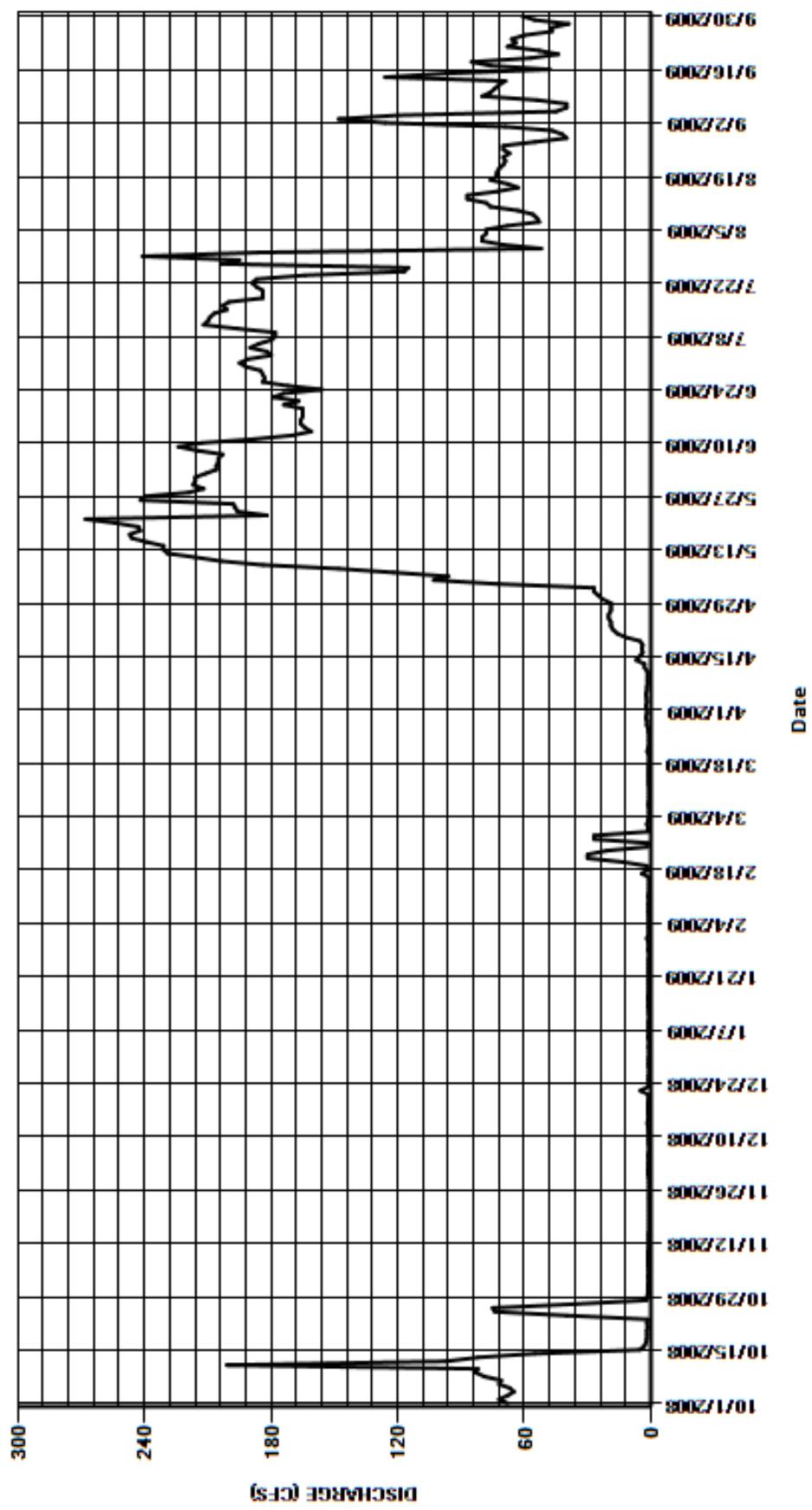
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	68	1.4	1.5	1	1.1	1.5	2	25	216	195	70	69
2	72	1.3	1.3	1.1	1.1	1.9	2.5	27	211	191	80	126
3	68	1.4	1.4	1.1	1.2	1.3	2	27	206	180	80	148
4	65	1.3	1.2	1	1.1	1.1	2.1	73	206	182	78	120
5	67	1.3	1.5	1.5	1.1	1	2.5	103	205	190	78	45
6	72	1.4	1.1	1.2	1.1	1	2	96	205	186	68	40
7	71	1.4	1	1.3	1.4	1.3	1.9	122	203	180	53	40
8	79	1.4	1.2	1.3	1.1	1.1	1.6	148	215	178	54	54
9	83	1.4	1.3	1.3	1.4	1	1.7	184	224	178	56	80
10	82	1.4	1.3	1	1	1	1.6	204	213	196	63	76
11	201	1.1	1.3	1.1	1.4	0.99	1.7	216	188	212	76	74
12	97	1.1	1.3	1.1	1.1	1.1	3	229	170	210	78	72
13	82	1.1	1.6	1.4	1	1.2	3	231	161	209	87	69
14	55	1.2	1.6	1.3	1	1.1	7	231	164	207	87	126
15	5.3	1.1	1.3	1.4	0.93	1.2	5.3	239	166	201	73	97
16	3.1	1	1.4	1.4	1	1.1	3.9	246	166	203	63	48
17	2.3	1	1.5	1.2	4.3	1.1	4.3	247	165	200	68	76
18	2	0.97	1.5	1.2	1.5	1.1	4	242	165	184	76	85
19	1.9	0.97	1.4	1.3	1.9	1	5.1	243	165	184	73	57
20	2	0.97	1.2	1.3	13	1	12	254	174	184	73	44
21	1.6	1	1.4	1.2	30	1.8	16	268	167	187	72	53
22	1.9	1	5	1.2	30	1.3	18	182	179	189	70	68
23	1.6	1	1.4	1.2	21	0.97	19	196	174	187	69	64
24	40	1.1	1.2	1.2	1.8	1.1	19	197	156	164	70	66
25	74	1	1.3	1.2	1.5	0.99	20	198	172	117	67	60
26	75	0.95	1.2	1.1	27	1.2	20	242	184	115	70	47
27	36	0.97	0.95	1	27	1.4	19	240	183	204	70	47
28	2.1	1	1.1	1.4	1.3	2	19	219	184	195	55	39
29	1.7	1.1	1.3	1.1	---	1.9	19	212	185	241	40	55
30	1.5	1.4	1.1	1.2	---	2.5	23	217	192	186	42	61
31	1.4	---	1.1	1.9	---	1.9	---	216	---	52	47	---
TOTAL	1415.4	34.73	43.95	38.2	178.33	40.15	261.2	5774	5564	5687	2106	2106
MEAN	45.7	1.16	1.42	1.23	6.37	1.3	8.71	186	185	183	67.9	70.2
AC-FT	2810	69	87	76	354	80	518	11450	11040	11280	4180	4180
MAX	201	1.4	5	1.9	30	2.5	23	268	224	241	87	148
MIN	1.4	0.95	0.95	1	0.93	0.97	1.6	25	156	52	40	39
CAL YR	2008	TOTAL	29752.07	MEAN	81.3	MAX	560	MIN	0.67	AC-FT	59010	
WTR YR	2009	TOTAL	23248.96	MEAN	63.7	MAX	268	MIN	0.93	AC-FT	46110	

MAX DISCH: 787 CFS AT 18:30 ON Oct. 11,2008 GH 3.87 FT. SHIFT -0.06 FT.

MAX GH: 3.87 FT. AT 18:30 ON Oct. 11,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**07124500 PURGATOIRE RIVER AT TRINIDAD
WY2009 HYDROGRAPH**



ARKANSAS RIVER BASIN
07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE
Water Year 2009

Location.-- Lat. 37°42'53", Long. 103°30'38", in NW ¼ sec. 7, T.27 S., R.54 W., Otero County, Hydrologic Unit 11020010, on left bank at Ninemile Dam, 4 mi southwest of Higbee, and 5.5 mi upstream from Smith Canyon. Prior to Apr. 21, 1978 gage located 850 ft, upstream.

Drainage and Period of Record.-- 2,752 mi².

Equipment.-- Sutron Constant Flow Bubbler water level sensor and satellite-monitored data collection platform (Sutron 8210 HDR DCP) in a 4 ft by 4 ft steel shelter. The primary gage is an outside drop tape from a reference point on a steel "I" beam on the wall face between Ninemile Dam and the Ninemile Canal headgate. Control is the Ninemile Canal Diversion Dam. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP data with satellite-monitored gage height data providing backup. Record complete and reliable, except for the following periods: Dec 9-17, 19-31, 2008, Jan 3-18, 25-31, and Feb 1-6, 2009, when the stage-discharge relationship was affected by ice on the control.

Datum Corrections.-- Levels were last run Aug 22, 2008, from RM No. 10 to the tape down RP and to the water surface. The tape length was checked and found to be 0.03 ft longer than the RP elevation. Tape length was shortened by 0.03 ft. It is unknown when the tape length error originated. New RP elevation and tape length as of Aug 22, 2008 is 12.96 ft.

Rating.-- The control is the Ninemile Canal Diversion Dam. Data for the stage-discharge relationship at this location are based on stage data collected on the upstream side of the diversion dam and discharge measurements made below the dam. Observations of zero flow past the dam are corroborated by measurements of zero flow in the channel below the dam. Rating No.17, started in use on October 5, 1998, was used this water year. It is well defined to about 500 cfs. Seventeen discharge measurements (Nos. 991-1007) were made ranging in discharge from 0 to 33.1 cfs. The peak flow of 2120 cfs occurred at 0900 Oct 13, 2008 at a gage height of 5.06 ft with a shift of -0.05 ft. It exceeded the stage of measurement No. 1003 made June 22, 2009, the high flow measurement for the WY, by 1.82 ft.

Discharge.-- Shifting control method used for the entire WY. Shifts on open water measurements ranged from -0.08 to +0.03 feet. All measurements were given full weight and applied directly. Shifts were prorated by time with consideration of stage change and high flow runoff events. Shifts are generally small and generally may be prorated from measurement to measurement, which implies a linear change in shift with time. Stage related shift changes were as larger runoff events occurred at the gage reflecting scour of the gage pool above the control and migration of shifts to the left. Shifts are seen to migrate back to the right as the gage pool fills. Shifts computed from observations of zero flow were applied to periods of low or no flow. In several cases debris on the dam resulted in large negative shifts to the PZF.

Special Computations.-- Flows during ice affected periods were estimated using temperature records from nearby NOAA max/min temperature station, partial day good record, and good record before and after ice effect. Total estimated flow past the gage (river plus Ninemile Canal) was compared, using hydrographs, to flows at upstream and downstream gages.

Remarks.-- Record fair, except during periods of estimated flow and flows over 500 cfs, which should be considered poor. The record for total flow in the river at this location is computed by adding Ninemile Canal flows to this record. High flows have not been measured at or near the gage due to a lack of facilities. Station maintained and record developed by Adam Adame .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE

RATING TABLE--

PURNINCO17 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	9.8	12	14	10	21	7.7	13	5.2	15	83	86
2	0	8.9	9.4	14	10	22	9.1	13	5.2	18	46	27
3	0	8.2	9.8	13	10	14	8.6	12	8.7	15	29	20
4	0	7.7	10	13	12	11	9.8	12	8.5	13	25	14
5	0	7.9	11	10	12	10	8.6	12	9.6	63	20	13
6	0	7.6	12	10	12	7.9	7.6	12	8.5	41	17	15
7	0	7.4	11	12	14	6.6	7.3	22	5.9	115	18	11
8	0	7.4	10	12	15	5.9	6.6	32	4.2	13	23	9.3
9	2.9	7.2	11	12	16	5.3	6.3	25	1.1	11	22	8.2
10	12	7.7	10	12	15	5.1	13	21	0.45	11	17	6.8
11	14	8.4	10	12	15	5	18	18	7.1	14	19	5.2
12	625	8.6	10	10	15	4.8	20	21	13	12	19	6.5
13	1100	9.4	10	7	15	5	22	20	36	11	12	11
14	121	8.9	8	9	14	5	20	19	53	9.7	13	8.6
15	74	8.7	6	10	14	3.8	20	17	61	8.1	14	7.2
16	88	8.7	6	11	14	3.3	21	15	27	6.4	9.4	5.9
17	26	8.8	8	12	14	3.9	22	14	19	4	8	5.7
18	18	8.8	9	13	13	4.3	21	12	14	1.2	7.7	15
19	15	8.9	9	12	13	3.8	19	11	11	0	9.4	8.3
20	12	8.8	9	12	13	2.7	20	11	9.3	0	0.37	5.8
21	11	9	7	13	12	0.94	21	11	13	19	2.8	9.4
22	10	9.1	8	13	11	0.2	20	34	25	28	7.7	9.9
23	10	9.1	10	13	11	0.01	21	290	31	9.5	8.5	15
24	11	9	11	13	11	0	24	65	22	16	7.2	30
25	11	8.8	12	12	10	0	24	36	23	56	2.8	26
26	9.9	9	12	9	10	0.14	19	27	24	214	0	24
27	9.6	9.2	12	8	11	4.1	17	18	18	47	0	25
28	11	9.5	10	8	9.8	5.2	16	13	12	0.39	0	23
29	14	10	10	10	---	6.2	15	15	7.2	266	0	17
30	12	10	12	8	---	5.2	14	9	8.8	737	0	15
31	10	---	14	10	---	6.8	---	6.9	---	179	78	---
TOTAL	2227.40	260.5	309.2	347.0	351.8	179.19	478.6	856.9	491.75	1953.29	518.87	483.8
MEAN	71.9	8.68	9.97	11.2	12.6	5.78	16	27.6	16.4	63	16.7	16.1
AC-FT	4420	517	613	688	698	355	949	1700	975	3870	1030	960
MAX	1100	10	14	14	16	22	24	290	61	737	83	86
MIN	0	7.2	6	7	9.8	0	6.3	6.9	0.45	0	0	5.2

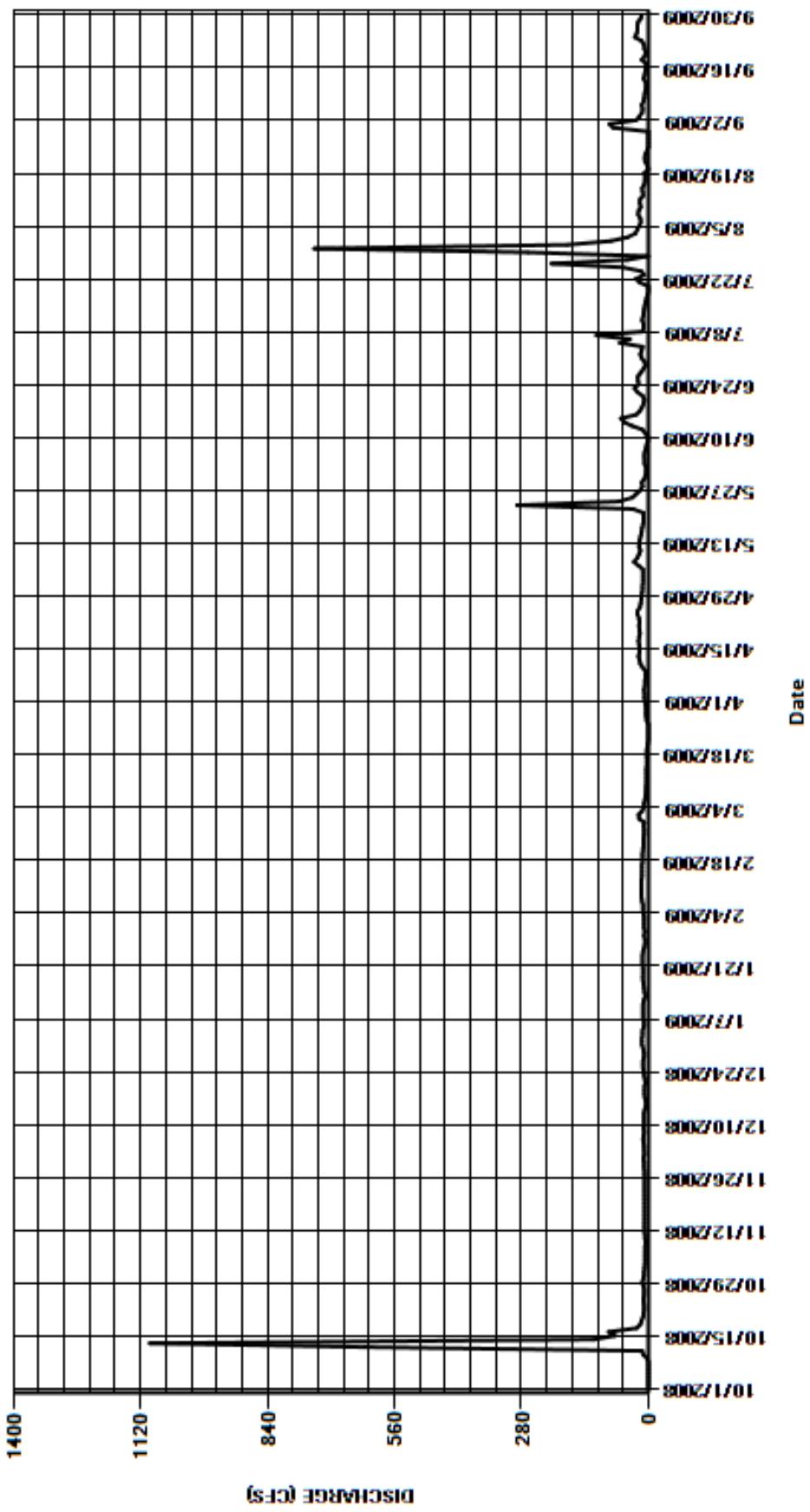
CAL YR	2008	TOTAL	12827.14	MEAN	35	MAX	1490	MIN	0	AC-FT	25440
WTR YR	2009	TOTAL	8458.30	MEAN	23.2	MAX	1100	MIN	0	AC-FT	16780

MAX DISCH: 2120 CFS AT 09:00 ON Oct. 13,2008 GH 5.06 FT. SHIFT -0.05 FT.

MAX GH: 5.06 FT. AT 09:00 ON Oct. 13,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
Water Year 2009

Location.-- Lat. 37°42'53", Long. 103°30'38", in NW ¼ sec. 7, T.27 S., R.54 W., Otero County.

Drainage and Period of Record.-- N/A

Equipment.-- Float-activated graphic water-stage recorder, SDI shaft encoder, and a High Data Rate Sutron SatLink DCP in a 3 ft by 3 ft steel shelter with well. Six-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP data with satellite-monitored data and the graphic chart recorder used for backup purposes. Record is complete and reliable, except for the periods: Dec 10-24, 28- 31, 2008, Jan 1- 6, 13-16, 25-30 , 2009, when the stage-discharge relationship was affected by ice.

Datum Corrections.-- No levels were run to the flume this water year.

Rating.-- The control is a standard, 6-foot, concrete, Parshall flume. Rating No. 1, in use since October 1, 1972, was used all year. One measurement (No. 314) was made this water year (GH= 0.90 ft, discharge = 19.4 cfs). The peak flow of 33.4 cfs occurred at 2045 on Jul. 31, 2009 at a gage height of 1.23 ft with a shift of 0.00 ft.

Discharge.-- The shift of -0.02 ft found with Msmt. No. 314 was adjusted -4% to 0.00 ft. The discharge record was computed by direct application of the rating with a shift of 0.00 ft.

Special Computations.-- Flows during periods of ice effect were estimated using temperature record, partial day good record, and good record before and after periods of ice effect.

Remarks.-- Record is good, except for periods of ice effect, which are estimated and poor. Station maintained and record developed by Adam Adame .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE

RATING TABLE--

NMCHIGCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	21	21	10	11	16	22	0.03	18	4.6	23	2.3
2	9.9	21	21	10	11	16	22	0.03	17	1.6	15	1.7
3	9.1	21	21	10	11	16	21	0.01	17	1.2	6.4	1.2
4	8.3	21	21	10	11	16	17	0	18	0.97	1.7	0.92
5	8.4	20	21	10	11	16	17	0	18	1.2	0.91	0.69
6	9.1	20	21	10	11	18	18	0	18	1.7	0.67	0.56
7	11	20	21	12	11	18	18	0	18	9.2	0.55	0.47
8	11	20	21	12	11	18	18	0	18	12	0.52	0.43
9	8.1	20	20	12	11	18	18	0	17	12	0.43	0.35
10	0.42	20	19	12	11	18	8.7	0	16	7.1	0.43	0.29
11	0.37	20	18	12	11	18	0.12	0	8.7	1.5	0.37	0.26
12	0.35	20	18	11	11	18	0.09	0	1.9	1.1	0.35	0.2
13	7.4	20	17	10	11	18	0.09	0	1.6	0.93	0.29	0.15
14	20	20	17	9	11	18	0.09	0	1.4	0.93	0.27	0.14
15	25	20	16	9	11	19	0.09	0	9.8	0.84	0.22	0.1
16	25	20	16	10	11	19	0.06	0	15	0.82	0.2	0.09
17	25	20	17	12	11	20	0.05	0.03	18	0.74	0.14	0.06
18	24	20	18	11	11	20	0.06	0.03	18	2.8	4.7	0.05
19	23	20	16	12	11	20	0.05	0.04	17	1.7	8	4.6
20	22	20	16	12	11	19	0.05	0.05	17	1.7	3.7	5.9
21	21	20	12	12	16	19	0.05	0.09	11	3.9	2.6	1.8
22	21	20	10	12	16	18	0.05	0.27	6.2	7.3	2	0.84
23	21	20	10	12	15	18	0.05	12	7.7	1.5	1.7	0.48
24	21	19	9	12	18	16	0.05	20	7.4	1.3	1.4	0.34
25	21	19	12	11	17	17	0.05	21	7.5	9	3.7	0.27
26	21	19	12	11	13	17	0.03	20	7.5	19	3.4	0.21
27	21	19	12	10	13	20	0.03	20	7.4	17	3.6	0.2
28	21	20	10	10	15	20	0.03	19	7.2	10	3.1	0.15
29	21	20	10	10	---	21	0.03	19	7	4.1	2.7	0.14
30	21	20	10	10	---	21	0.03	19	7.1	8.8	2.9	0.09
31	21	---	10	11	---	21	---	18	---	28	5.9	---
TOTAL	488.44	600	493.0	337.0	343	567	180.85	168.58	359.4	174.53	100.85	24.98
MEAN	15.8	20	15.9	10.9	12.2	18.3	6.03	5.44	12	5.63	3.25	0.83
AC-FT	969	1190	978	668	680	1120	359	334	713	346	200	50
MAX	25	21	21	12	18	21	22	21	18	28	23	5.9
MIN	0.35	19	9	9	11	16	0.03	0	1.4	0.74	0.14	0.05

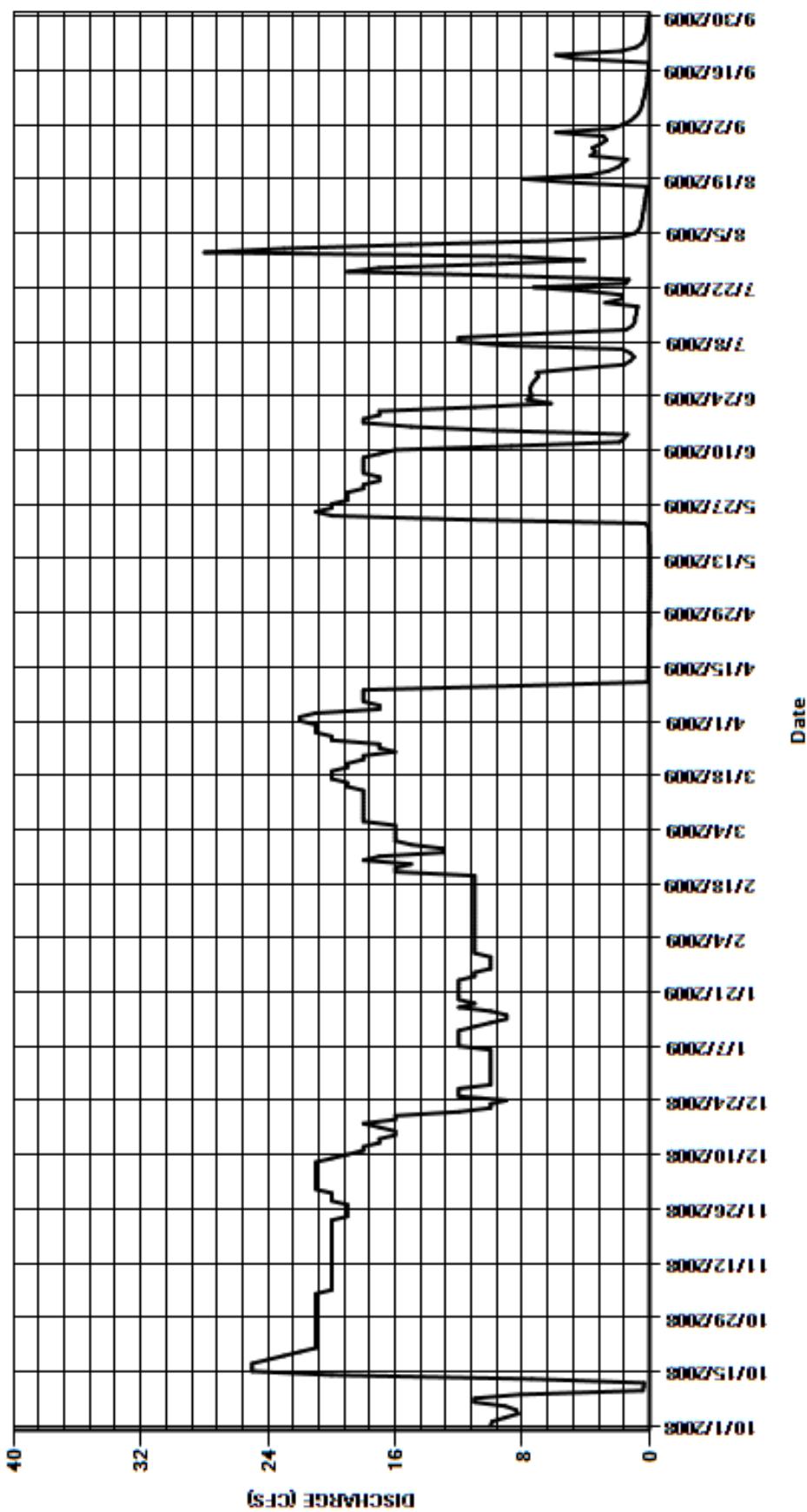
CAL YR	2008	TOTAL	3533.04	MEAN	9.65	MAX	47	MIN	0.06	AC-FT	7010
WTR YR	2009	TOTAL	3837.63	MEAN	10.5	MAX	28	MIN	0	AC-FT	7610

MAX DISCH: 33 CFS AT 20:45 ON Jul. 31,2009 GH 1.23 FT. SHIFT 0 FT.

MAX GH: 1.23 FT. AT 20:45 ON Jul. 31,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C
Water Year 2009

Location.-- Combined record from Purgatoire River at Ninemile Dam and Ninemile Canal below Ninemile Dam gages both located at Lat 37°42'53", long 103°30'38", in NW $\frac{1}{4}$ sec. 7, T.27 S., R.54 W., Otero County, Hydrologic Unit 11020010, on left bank at Ninemile Dam, 4 mi southwest of Higbee, and 5.5 mi upstream from Smith Canyon.

Drainage and Period of Record.-- 2,752 mi².

Equipment.-- See individual records for gage equipment descriptions.

Hydrographic Conditions.--

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of discharges was obtained by the addition of daily flows from the Ninemile Canal to the corresponding daily flows in the Purgatoire River at Ninemile Dam. Mean daily discharge was estimated on the following days: Dec 9-24, 19-31, 2008, Jan 1-18, 25-31, and Feb 1-6, 2009, when the stage-discharge relationship was affected by ice. The peak unit value combined discharge for the year was 2120 cfs at 0900 on Oct 13, 2008.

Special Computations.--

Remarks.-- Combined record is fair, except record should be considered poor during periods of estimated flow and during periods where discharge in the river exceeds 500 cfs, above which the rating has not been verified by measurements. See individual records for more details. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

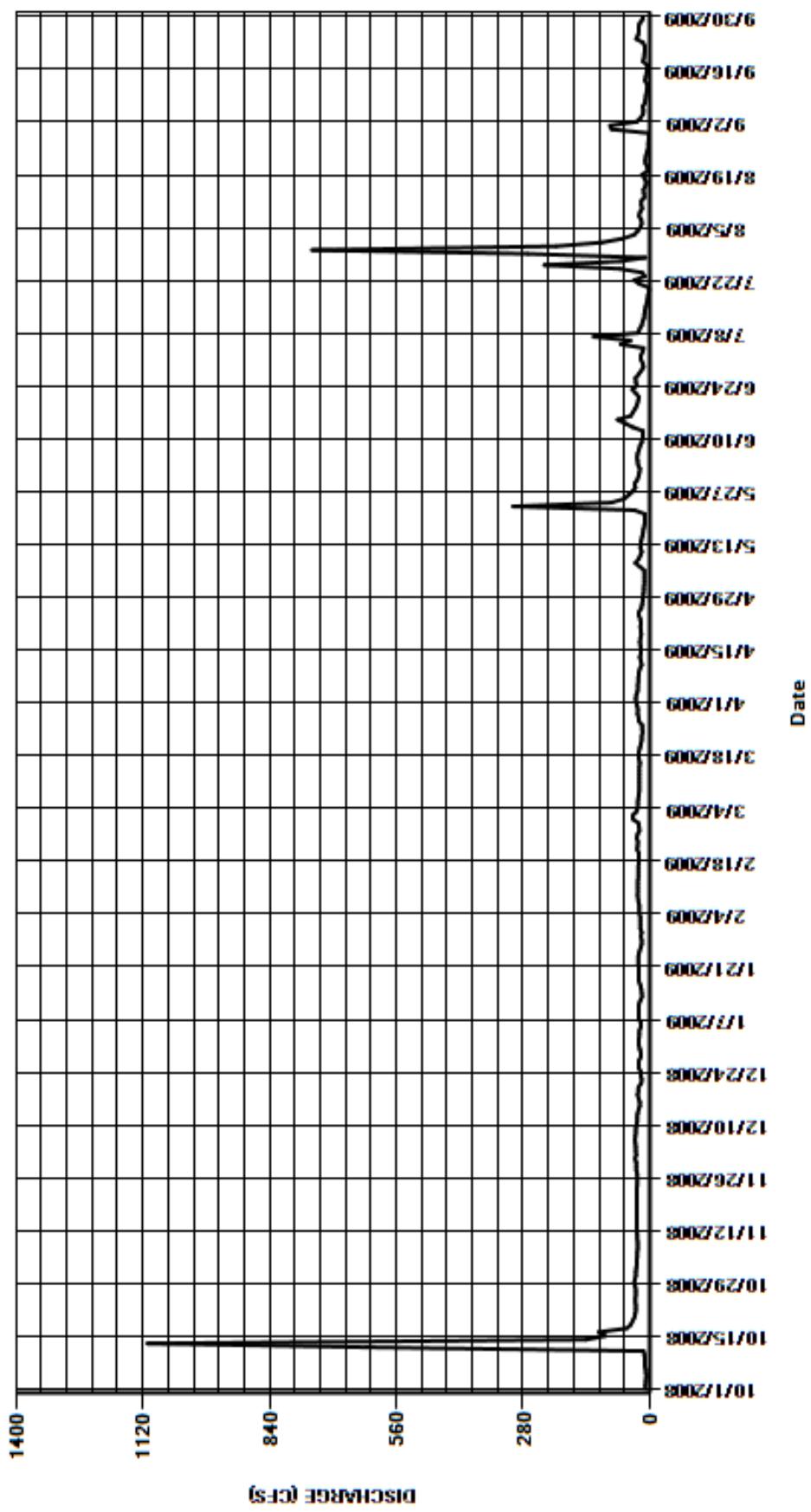
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	31	33	24	21	37	30	13	23	20	106	88
2	9.9	30	30	24	21	38	31	13	22	20	61	29
3	9.1	29	31	23	21	30	30	12	26	16	35	21
4	8.3	29	31	23	23	27	27	12	27	14	27	15
5	8.4	28	32	20	23	26	26	12	28	64	21	14
6	9.1	28	33	20	23	26	26	12	27	43	18	16
7	11	27	32	24	25	25	25	22	24	124	19	11
8	11	27	31	24	26	24	25	32	22	25	24	9.7
9	11	27	31	24	27	23	24	25	18	23	22	8.5
10	12	28	29	24	26	23	22	21	16	18	17	7.1
11	14	28	28	24	26	23	18	18	16	16	19	5.5
12	625	29	28	21	26	23	20	21	15	13	19	6.7
13	1110	29	27	17	26	23	22	20	38	12	12	11
14	141	29	25	18	25	23	20	19	54	11	13	8.7
15	99	29	22	19	25	23	20	17	71	8.9	14	7.3
16	113	29	22	21	25	22	21	15	42	7.2	9.6	6
17	51	29	25	24	25	24	22	14	37	4.7	8.1	5.8
18	42	29	27	24	24	24	21	12	32	4	12	15
19	38	29	25	24	24	24	19	11	28	1.7	17	13
20	34	29	25	24	24	22	20	11	26	1.7	4.1	12
21	32	29	19	25	28	20	21	11	24	23	5.4	11
22	31	29	18	25	27	18	20	34	31	35	9.7	11
23	31	29	20	25	26	18	21	302	39	11	10	15
24	32	28	20	25	29	16	24	85	29	17	8.6	30
25	32	28	24	23	27	17	24	57	31	65	6.5	26
26	31	28	24	20	23	17	19	47	32	233	3.4	24
27	31	28	24	18	24	24	17	38	25	64	3.6	25
28	32	30	20	18	25	25	16	32	19	10	3.1	23
29	35	30	20	20	---	27	15	34	14	270	2.7	17
30	33	30	22	18	---	26	14	28	16	746	2.9	15
31	31	---	24	21	---	28	---	25	---	207	84	---
TOTAL	2717.8	862	802	684	695	746	660	1025	852	2128.2	617.7	507.3
MEAN	87.7	28.7	25.9	22.1	24.8	24.1	22	33.1	28.4	68.7	19.9	16.9
AC-FT	5390	1710	1590	1360	1380	1480	1310	2030	1690	4220	1230	1010
MAX	1110	31	33	25	29	38	31	302	71	746	106	88
MIN	8.3	27	18	17	21	16	14	11	14	1.7	2.7	5.5
CAL YR	2008	TOTAL	16380.45	MEAN	44.8	MAX	1540	MIN	0.27	AC-FT	32490	
WTR YR	2009	TOTAL	12297.0	MEAN	33.7	MAX	1110	MIN	1.7	AC-FT	24390	

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER AT NINE MILE DAM, NEAR HIGBEE (C
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS
Water Year 2009

Location.-- Lat. 37°54'03", Long. 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.

Drainage and Period of Record.-- 3253.14 sq.mi.

Equipment.-- Sutron Constant Flow Bubbler water level sensor and satellite-monitored high data rate data collection platform in a 4 ft x 4 ft steel shelter. Primary reference gage is a drop tape gage referenced to the top of "C" channel attached to face of concrete flood block on left side channel bank holding bubbler orifice line. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP data with satellite-monitored data and CFB log used for backup purposes. Record is complete and reliable, except for the following periods: Sep. 15, 2009, when the orifice line was plugged; and, Dec. 9-30, 2008, Jan. 5-7, 13-15, 25-31, Feb 1-3, 2009, when ice affected the stage discharge relationship.

Datum Corrections.-- Levels were last run August 22, 2008 to the water surface and the drop tape RP using RM No. 1 as base. No corrections were required.

Rating.-- The control at low to medium flows (up to 500 cfs) is the primary channel with silt, sand, gravel and cobble bed and earthen banks. Bank vegetation of variable density in secondary overbank areas (primarily left side) affects flows above 500 cfs considerably. Rating No. 3, dated October 1, 2003 was used for the entire water year. It is well-defined to approximately 500 cfs, which is considered to be the primary channel capacity. Above 500 cfs, flow spills out of the channel and the control changes – this portion of the rating is based on a channel survey. Eighteen discharge measurements (Nos. 138 – 155) were made during the water year. Measured discharge ranged from 0.00 to 80.7 cfs. They cover the range in stage experienced, except for the following days with higher mean daily flows: Oct. 12-18, 2008; May 23-26; July 6, 7, 26, 27, 30, 31; Aug 1, 2; Sep 1, 2; 2009. The peak flow pf 3790 cfs occurred at 1930 Oct 13, 2008 at a gage height of 8.57 ft with a shift of -0.20 ft. It exceeded the stage of maximum flow measurement for the water year (No. 148 made on May 27, 2009) by 6.08 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and connected to hydrologic events, where possible. Open water measurements show shifts varying between -0.20 and 0.02 feet. All open water measurements were given full weight. Three observations of zero flow were made. Shifts were computed for these observations and the resulting shift applied to periods of very low flow or zero flow.

Special Computations.-- Flows during periods of ice effect were estimated using temperature records, partial day good record and good record before and after ice effect. Flows during periods of no geage height record were estimated using good record and flow trends before and after.

Remarks.-- Record fair, except during periods of no record and ice affected record, and during periods when flows exceed 500 cfs (no facilities at this location to measure flows above 500 cfs), which should be considered poor. Station maintained and record developed by Adam Adame .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS

RATING TABLE--

PURHILCO03 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

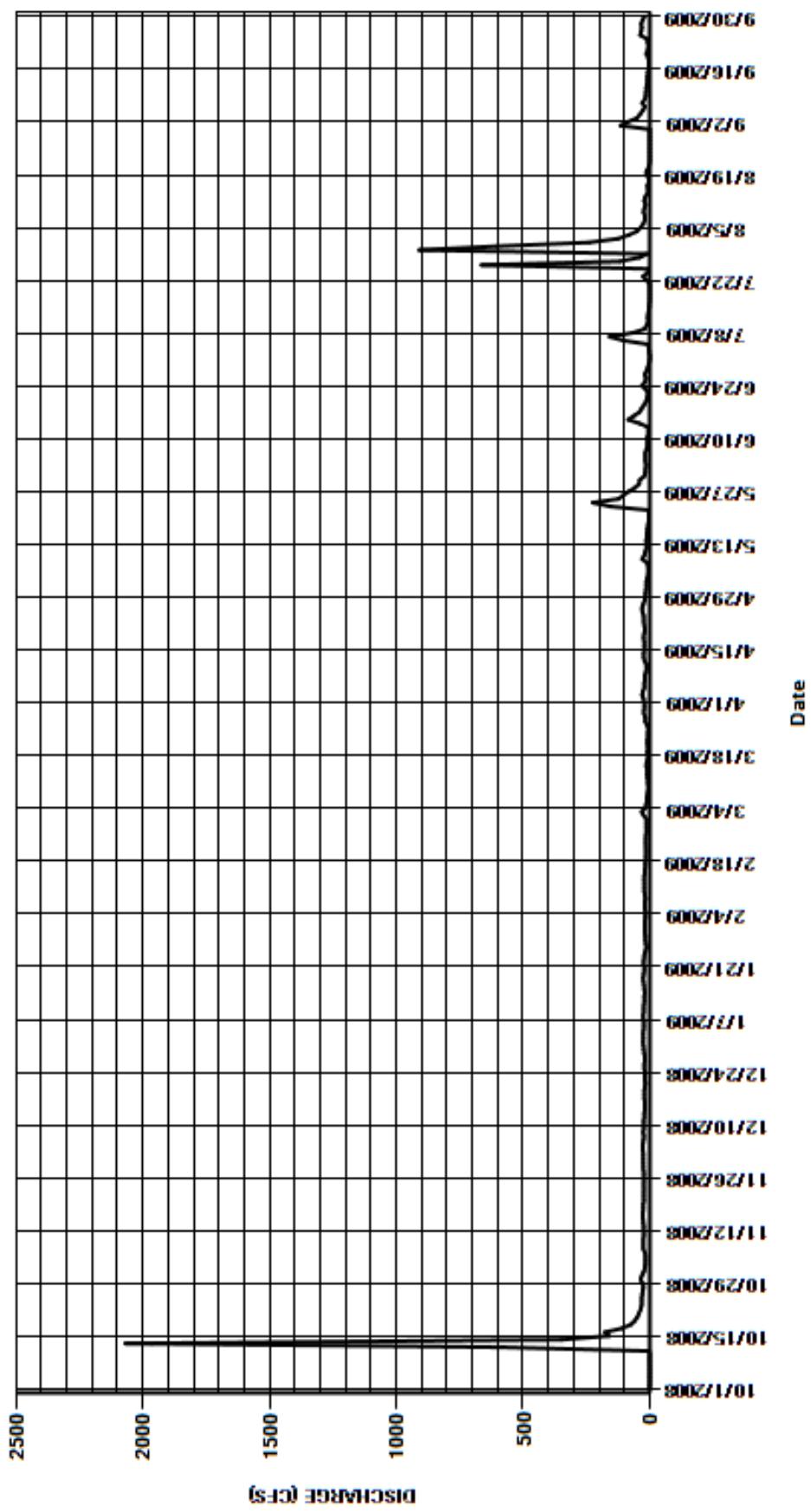
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	24	26	27	20	13	22	15	18	0.52	240	116
2	0.95	20	26	25	20	24	25	14	17	0.03	125	86
3	0.42	18	27	26	18	32	30	14	15	2.9	82	50
4	0.12	17	27	25	18	19	27	10	18	3.9	50	39
5	0.02	17	27	23	19	14	21	7.3	18	8.3	35	28
6	0.02	19	25	23	19	12	22	6.8	19	104	25	19
7	0	25	23	25	20	11	20	7.2	14	159	19	30
8	0.74	25	26	26	18	8.9	21	10	9.6	69	20	20
9	1.3	25	24	24	20	6.9	16	30	9.4	22	24	16
10	0.55	25	24	24	22	7.5	13	22	12	13	22	15
11	2.1	23	24	23	22	8	13	18	7	7	17	14
12	580	25	22	21	22	9.8	21	13	5.9	8.2	22	12
13	2070	24	22	22	23	12	24	13	6.8	6.8	19	9.7
14	350	26	20	20	22	10	24	14	40	4.2	8.9	10
15	161	27	20	22	19	14	22	12	85	2.4	7.2	8
16	177	27	20	23	19	13	22	11	63	1.4	10	5.8
17	111	27	22	25	18	8.4	22	9.9	41	0.45	4.4	4.4
18	75	26	22	26	17	9.1	24	7.2	32	0	5.5	3.8
19	60	26	22	24	16	9.7	23	5.1	22	0	13	6.6
20	49	23	20	22	15	8.5	20	3.4	14	0	13	14
21	43	24	18	22	15	10	21	3.1	10	0	4.1	8.1
22	37	24	20	25	16	10	23	3.1	7.5	14	1.1	6.1
23	33	23	20	23	17	8.3	23	158	15	27	0.03	8.2
24	32	24	20	22	16	7.8	24	225	31	7.8	0.02	12
25	32	23	22	18	15	6.8	29	123	19	5.9	0.2	38
26	30	23	22	14	13	11	31	104	15	664	0	34
27	28	23	20	16	14	19	26	82	21	117	0	32
28	25	25	20	18	14	18	21	58	13	41	0	34
29	29	25	22	18	---	23	19	42	7.8	11	0.05	29
30	37	26	24	20	---	23	17	40	2.8	910	0.03	20
31	31	---	25	20	---	22	---	22	---	604	0.02	---
TOTAL	3998.02	709	702	692	507	409.7	666	1103.1	608.8	2814.80	767.55	728.7
MEAN	129	23.6	22.6	22.3	18.1	13.2	22.2	35.6	20.3	90.8	24.8	24.3
AC-FT	7930	1410	1390	1370	1010	813	1320	2190	1210	5580	1520	1450
MAX	2070	27	27	27	23	32	31	225	85	910	240	116
MIN	0	17	18	14	13	6.8	13	3.1	2.8	0	0	3.8
CAL YR	2008	TOTAL	19354.34	MEAN	52.9	MAX	3100	MIN	0	AC-FT	38390	
WTR YR	2009	TOTAL	13706.67	MEAN	37.6	MAX	2070	MIN	0	AC-FT	27190	

MAX DISCH: 3790 CFS AT 19:30 ON Oct. 13,2008 GH 8.57 FT. SHIFT -0.2 FT.

MAX GH: 8.57 FT. AT 19:30 ON Oct. 13,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN

HIGHLAND CANAL

Water Year 2009

Location.--	Lat. 37°54'03", Long. 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.
Drainage and Period of Record.--	N/A
Equipment.--	Float-activated graphic water-stage recorder and shaft encoder in small shelter over CMP stilling well. Shaft encoder wired to satellite-monitored data collection platform (Sutron 8210 HDR DCP) located in Purgatoire River below Highland Dam gage shelter. Standard 5-ft steel Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. No equipment changes were made this year.
Hydrographic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except as noted below. Canal ran from Oct. 11 to Nov. 6, 2008 because the dam on the canal broke. Water inadvertently diverted was returned to the Purgatoire River through the waste gate just downstream of the canal flume and just below the Purgatoire River Below Highland Dam near Las Animas gage site. The canal was shut off for the year on September 15, 2009. October 11-31, 2008 – the graphic chart recorder was used because the shaft encoder was off. November 1-5, 2008 – gage height was estimated using chart recorder data before and after this period because the chart was not recording and the shaft encoder was off. January 27-28, 2009 – the gage height was suspect from the shaft encoder and estimated using chart data.
Datum Corrections.--	Levels were last run to the flume on August 5, 2003 from Benchmark #1 (Elv.16.288). The flume was found to be level and no corrections were made.
Rating.--	The control is a standard, 5-foot, steel Parshall flume. A standard 5-ft Parshall flume rating table, in use since May 23, 2001 was used during the entire water year. There was one discharge measurement made (No. 3 made on May 5, 2009,) this year. Peak flow of 81.8 cfs occurred at 1800 June 10, 2009 at a gage height of 2.43 ft with a shift of 0.00 ft. It exceeded the stage of the measurement 3 by 2.07 ft.
Discharge.--	Measurement no. 3 was discounted 3% to a zero shift and the standard 5-ft Parshall flume rating was applied directly to compute the discharge record.
Special Computations.--	
Remarks.--	Record good, except for periods of missing gage height record, which are estimated and poor. Station maintained and record developed by Adam Adame.
Recommendations.--	Levels should be run in WY10.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HIGHLAND CANAL

RATING TABLE--

STD05FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	4.5	0	0	0	0	0	0	3.6	3.6	3.4	2.7
2	0	4.5	0	0	0	0	0	0	3.5	2.9	3.5	3.7
3	0	4.5	0	0	0	0	0	0	3.7	3.6	3.5	3.7
4	0	4.5	0	0	0	0	0	2.5	3.9	3.6	3.4	3.8
5	0	4.5	0	0	0	0	0	4.5	4	3.6	3.4	3.7
6	0	1.9	0	0	0	0	0	4.4	4	4.2	3.7	3.6
7	0	0	0	0	0	0	0	3.4	3.8	2.8	3.8	3.7
8	0	0	0	0	0	0	0	3.5	3.6	3.4	3.6	3.7
9	0	0	0	0	0	0	0	3.8	3.6	3.6	3.5	3.8
10	0	0	0	0	0	0	0	3.6	11	3.8	3.6	3.8
11	1.4	0	0	0	0	0	0	3.6	2.5	3.7	3.5	3.8
12	0.23	0	0	0	0	0	0	3.7	1.3	3.8	3.6	3.8
13	15	0	0	0	0	0	0	3.9	1.3	3.7	3.6	3.7
14	6	0	0	0	0	0	0	3.8	1.5	3.6	3.4	3.4
15	4.9	0	0	0	0	0	0	3.7	2.7	3.6	3.4	1.5
16	5	0	0	0	0	0	0	3.8	3.5	3.6	3.5	0
17	4.1	0	0	0	0	0	0	3.8	3.5	3.5	3.4	0
18	4	0	0	0	0	0	0	3.6	3.4	3.1	3.6	0
19	3.8	0	0	0	0	0	0	3.6	3.4	2.4	3.6	0
20	3.8	0	0	0	0	0	0	3.7	3.5	1.7	3.9	0
21	4	0	0	0	0	0	0	3.9	3.7	3.3	3.8	0
22	4.1	0	0	0	0	0	0	3.8	3.7	2.8	3.6	0
23	4.3	0	0	0	0	0	0	3.5	3.8	3.7	3.3	0
24	4.3	0	0	0	0	0	0	3.1	4	3.8	3.5	0
25	4.3	0	0	0	0	0	0	3.7	3.7	4	3.6	0
26	4.3	0	0	0	0	0	0	3.5	3.6	3.6	3.5	0
27	4.3	0	0	0	0	0	0	3.7	3.7	3	3.5	0
28	4.3	0	0	0	0	0	0	3.6	3.6	3.6	3.2	0
29	4.1	0	0	0	---	0	0	3.8	3.6	3.4	3	0
30	4.3	0	0	0	---	0	0	3.9	3.8	3.8	2.7	0
31	4.5	---	0	0	---	0	---	3.6	---	3.4	2	---
TOTAL	95.03	24.40	0.00	0.00	0.00	0.00	0.00	103.00	108.5	106.2	106.6	52.40
MEAN	3.07	0.81	0	0	0	0	0	3.32	3.62	3.43	3.44	1.75
AC-FT	188	48	0	0	0	0	0	204	215	211	211	104
MAX	15	4.5	0	0	0	0	0	4.5	11	4.2	3.9	3.8
MIN	0	0	0	0	0	0	0	0	1.3	1.7	2	0

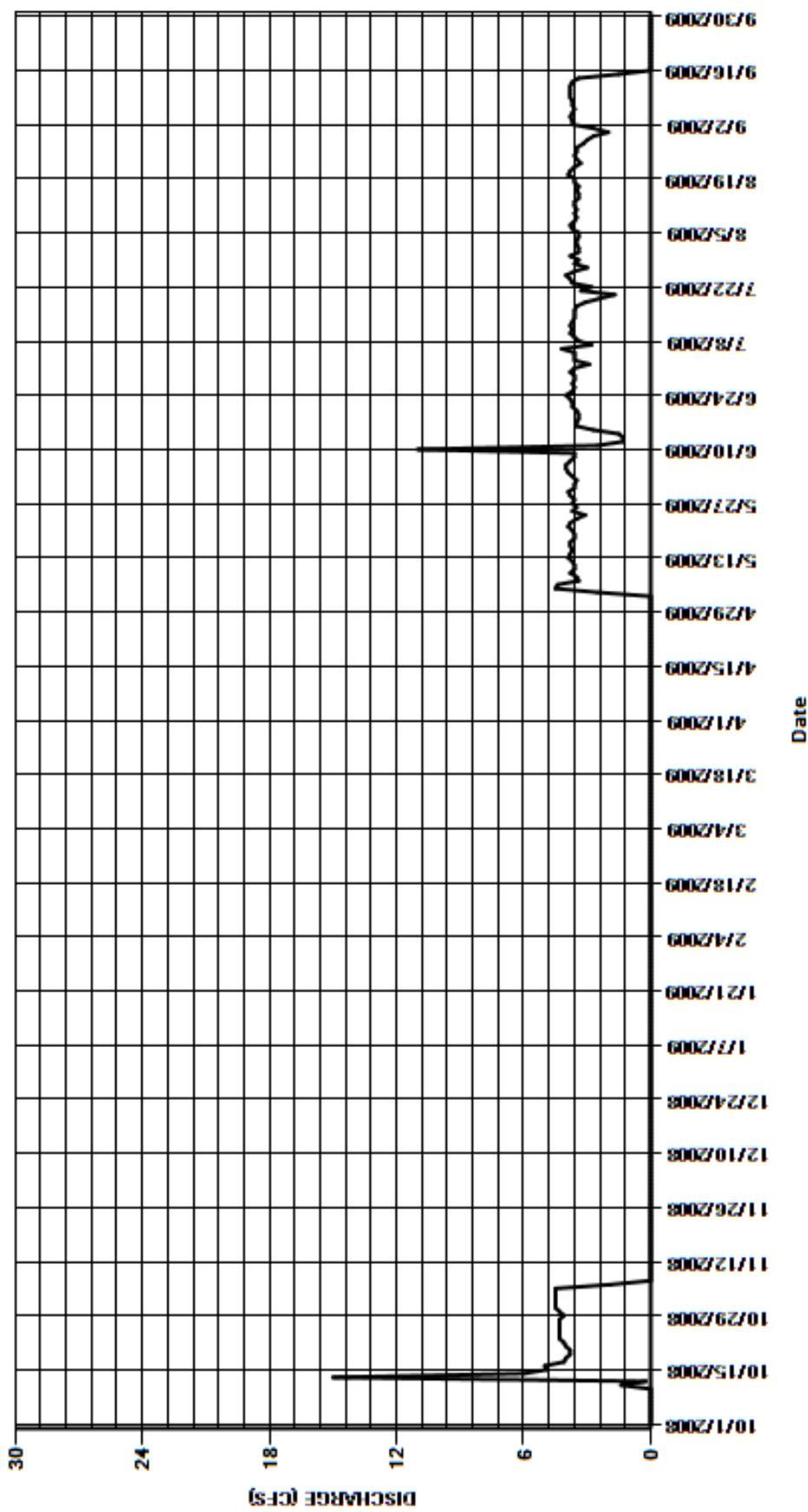
CAL YR	2008	TOTAL	538.00	MEAN	1.47	MAX	15	MIN	0	AC-FT	1070
WTR YR	2009	TOTAL	596.13	MEAN	1.63	MAX	15	MIN	0	AC-FT	1180

MAX DISCH: 82 CFS AT 18:00 ON Jun. 10,2009 GH 2.43 FT. SHIFT 0 FT.

MAX GH: 2.43 FT. AT 18:00 ON Jun. 10,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HIGHLAND CANAL
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMA
Water Year 2009

Location.-- Combined record from Purgatoire River below Highland Dam and Highland Canal below Highland Dam gages located Lat 37°54'03", Long 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately 1/4 mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.

Drainage and Period of Record.-- N/A.

Equipment.-- See individual records for gage equipment descriptions.

Hydrographic Conditions.--

Gage-Height Record.-- See individual station analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of discharges was obtained by the addition of Highland Canal daily flows to the corresponding daily flows in the Purgatoire River below Highland Dam. Mean daily discharge was estimated on the following days: Sep. 15, 2009, when the river gage orifice line was plugged; Dec. 9-30, 2008, Jan. 5-7, 13-15, 25-31, Feb 1-3, 2009, when ice affected the stage discharge relationship for the river gage; November 1-5, 2008 when canal gage height was estimated using chart recorder data before and after this period because the chart was not recording and the shaft encoder was off; January 27-28, 2009, when canal gage height was suspect from the shaft encoder and estimated using chart data. The peak unit value combined discharge for the year was 3810 cfs at 1930 on October 13, 2008.

Special Computations.--

Remarks.-- Combined record is fair, except during periods of estimated flow and flows greater than 500 cfs, which should be considered poor. See individual station analyses for the two gages for more details. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	29	26	27	20	13	22	15	22	4.1	243	119
2	0.95	25	26	25	20	24	25	14	21	2.9	129	90
3	0.42	23	27	26	18	32	30	14	19	6.5	86	54
4	0.12	22	27	25	18	19	27	13	22	7.5	53	43
5	0.02	22	27	23	19	14	21	12	22	12	38	32
6	0.02	21	25	23	19	12	22	11	23	108	29	23
7	0	25	23	25	20	11	20	11	18	162	23	34
8	0.74	25	26	26	18	8.9	21	14	13	72	24	24
9	1.3	25	24	24	20	6.9	16	34	13	26	28	20
10	0.55	25	24	24	22	7.5	13	26	23	17	26	19
11	3.5	23	24	23	22	8	13	22	9.5	11	21	18
12	580	25	22	21	22	9.8	21	17	7.2	12	26	16
13	2090	24	22	22	23	12	24	17	8.1	11	23	13
14	356	26	20	20	22	10	24	18	42	7.8	12	13
15	166	27	20	22	19	14	22	16	88	6	11	9.5
16	182	27	20	23	19	13	22	15	67	5	14	5.8
17	115	27	22	25	18	8.4	22	14	45	4	7.8	4.4
18	79	26	22	26	17	9.1	24	11	35	3.1	9.1	3.8
19	64	26	22	24	16	9.7	23	8.7	25	2.4	17	6.6
20	53	23	20	22	15	8.5	20	7.1	18	1.7	17	14
21	47	24	18	22	15	10	21	7	14	3.3	7.9	8.1
22	41	24	20	25	16	10	23	6.9	11	17	4.7	6.1
23	37	23	20	23	17	8.3	23	162	19	31	3.3	8.2
24	36	24	20	22	16	7.8	24	228	35	12	3.5	12
25	36	23	22	18	15	6.8	29	127	23	9.9	3.8	38
26	34	23	22	14	13	11	31	108	19	668	3.5	34
27	32	23	20	16	14	19	26	86	25	120	3.5	32
28	29	25	20	18	14	18	21	62	17	45	3.2	34
29	33	25	22	18	---	23	19	46	11	14	3	29
30	41	26	24	20	---	23	17	44	6.6	914	2.7	20
31	36	---	25	20	---	22	---	26	---	607	2	---
TOTAL	4096.42	736	702	692	507	409.7	666	1212.7	721.4	2923.2	878.0	783.5
MEAN	132	24.5	22.6	22.3	18.1	13.2	22.2	39.1	24	94.3	28.3	26.1
AC-FT	8130	1460	1390	1370	1010	813	1320	2410	1430	5800	1740	1550
MAX	2090	29	27	27	23	32	31	228	88	914	243	119
MIN	0	21	18	14	13	6.8	13	6.9	6.6	1.7	2	3.8

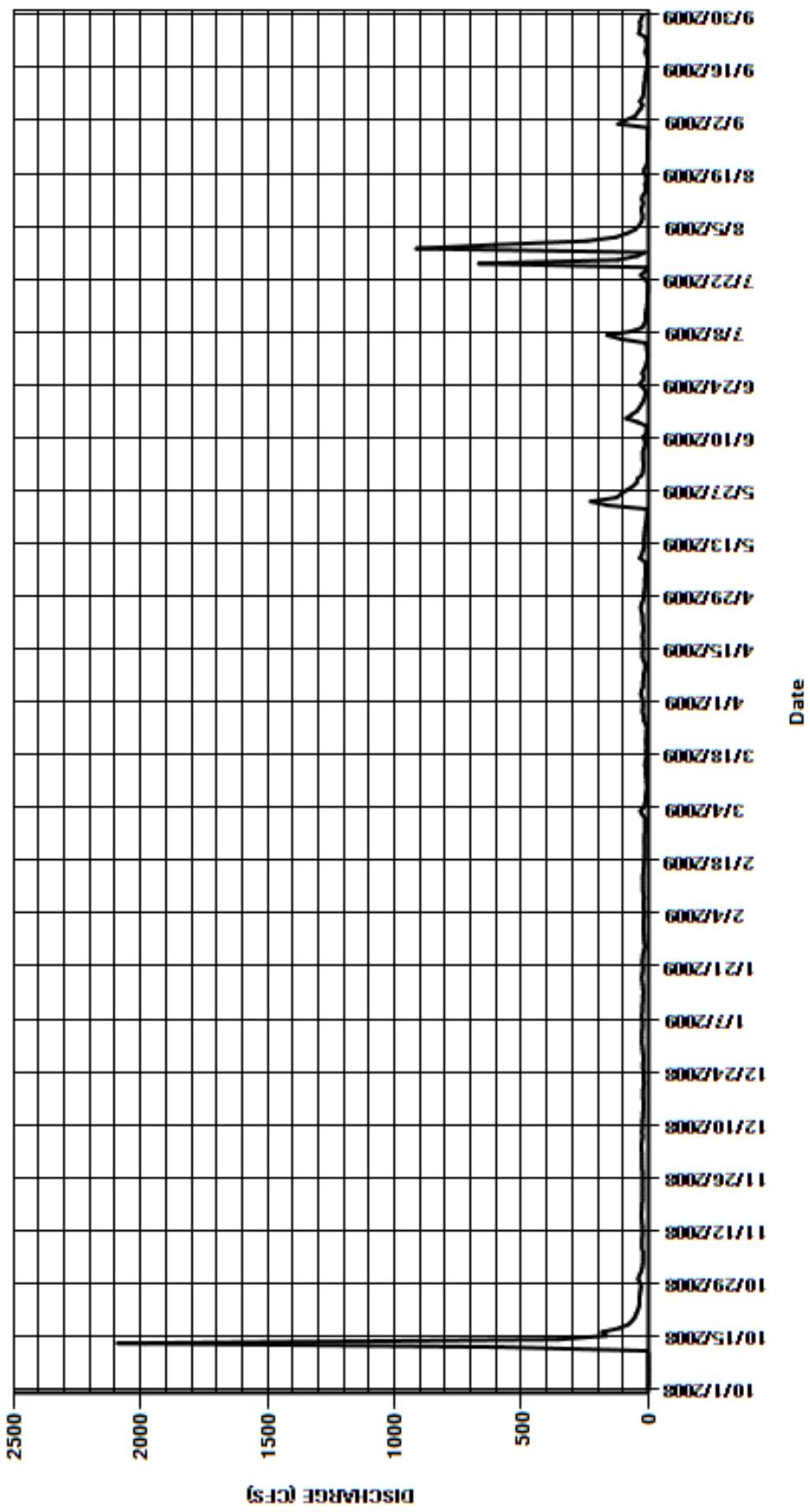
CAL YR	2008	TOTAL	19910.07	MEAN	54.4	MAX	3100	MIN	0	AC-FT	39490
WTR YR	2009	TOTAL	14327.92	MEAN	39.3	MAX	2090	MIN	0	AC-FT	28420

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO
Water Year 2009

Location.-- Lat. 37°45'46", Long. 103°14'36" (Toonerville, Colorado quadrangle, 1:24000 scale) in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec.21, T26S, R52W, Bent County on the north bridge abutment at the crossing of CR 11 and Muddy Creek.

Drainage and Period of Record.-- 166.95 sq. mi. The gage was established in the 1970's. It is unknown at this time how long the station was operated before it was abandoned. The station was reopened in the October of 2004 utilizing the existing stilling well.

Equipment.-- High data rate Sutron SatLink Logger and shaft encoder in a steel "half shelter" mounted on top of a 24-inch corrugated metal stilling well. Shaft encoder is referenced to a drop tape from an "I" beam on the downstream side of a bridge rail. A tipping bucket precipitation gage is also monitored by the DCP. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP log data with satellite-monitored data used for backup purposes. The record is complete and reliable, except for the following periods: Oct 12-17, 2008, July 7, 22, 26, 27, 29-31, August 6-7, 11 -12, 19-20, 27, 2009, when gage heights are not considered to be indicative of flow in the creek. Specifically, gage heights may not have accurately estimated the flow because the float is sitting on mud or is below the point of zero flow.

Datum Corrections.-- Levels were not run this water year. Levels were run April 8, 2005 to establish gage datum and point of zero flow.

Rating.-- The control at low and medium flows is the sand and mud channel along with vegetation in the channel. Control at higher stages includes the riverbanks, and brush lining the edges of the channel. Flows are contained by the bridge immediately upstream of the gage. Rating No.3 dated June 17, 2010 was used for entire water year after analysis of Rating No 1 and measured flows showed that a new rating curve was needed. Rating No.3 was developed from analysis of HEC-RAS modeling and field measurements. Eleven discharge measurements were made this water year which included ten observations of no flow. Measurement 34 showed a discharge of 3.29 cfs at a gage height of 2.30 ft. The peak flow of 505 cfs occurred at 0215 July 26, 2009 at a gage height of 7.07 ft with a shift of 0.00 ft. The peak exceeded measurement 34 by 4.77 ft. in stage.

Discharge.-- Shifting control method was used for the entire water year. Rating No.3 coupled with a point of zero flow at 1.70 feet produced the discharge record.

Special Computations.-- Numerous no flow observations, as well as precipitation data collected at this site, were used to estimate periods of no/trace flow for the record.

Remarks.-- The record should be considered poor. The flashy nature and remote location of the gage make it extremely difficult to maintain an accurate stage-discharge rating. Record developed by Adam Adame and Charlie DiDomenico.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO

RATING TABLE--

MUDTOOCO003 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	57	0
7	0	0	0	0	0	0	0	0	0	3.5	1.8	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	18	0
12	3.3	0	0	0	0	0	0	0	0	0	2.3	0
13	0.13	0	0	0	0	0	0	0	0	0	0	0
14	0.09	0	0	0	0	0	0	0	0	0	0	0
15	0.15	0	0	0	0	0	0	0	0	0	0	0
16	0.06	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	27	0
20	0	0	0	0	0	0	0	0	0	0	0.39	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	2.7	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	69	0	0
27	0	0	0	0	0	0	0	0	0	0.33	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	0	1.9	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	3.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.43	106.49	0.00
MEAN	0.12	0	0	0	0	0	0	0	0	2.5	3.44	0
AC-FT	7.4	0	0	0	0	0	0	0	0	154	211	0
MAX	3.3	0	0	0	0	0	0	0	0	69	57	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

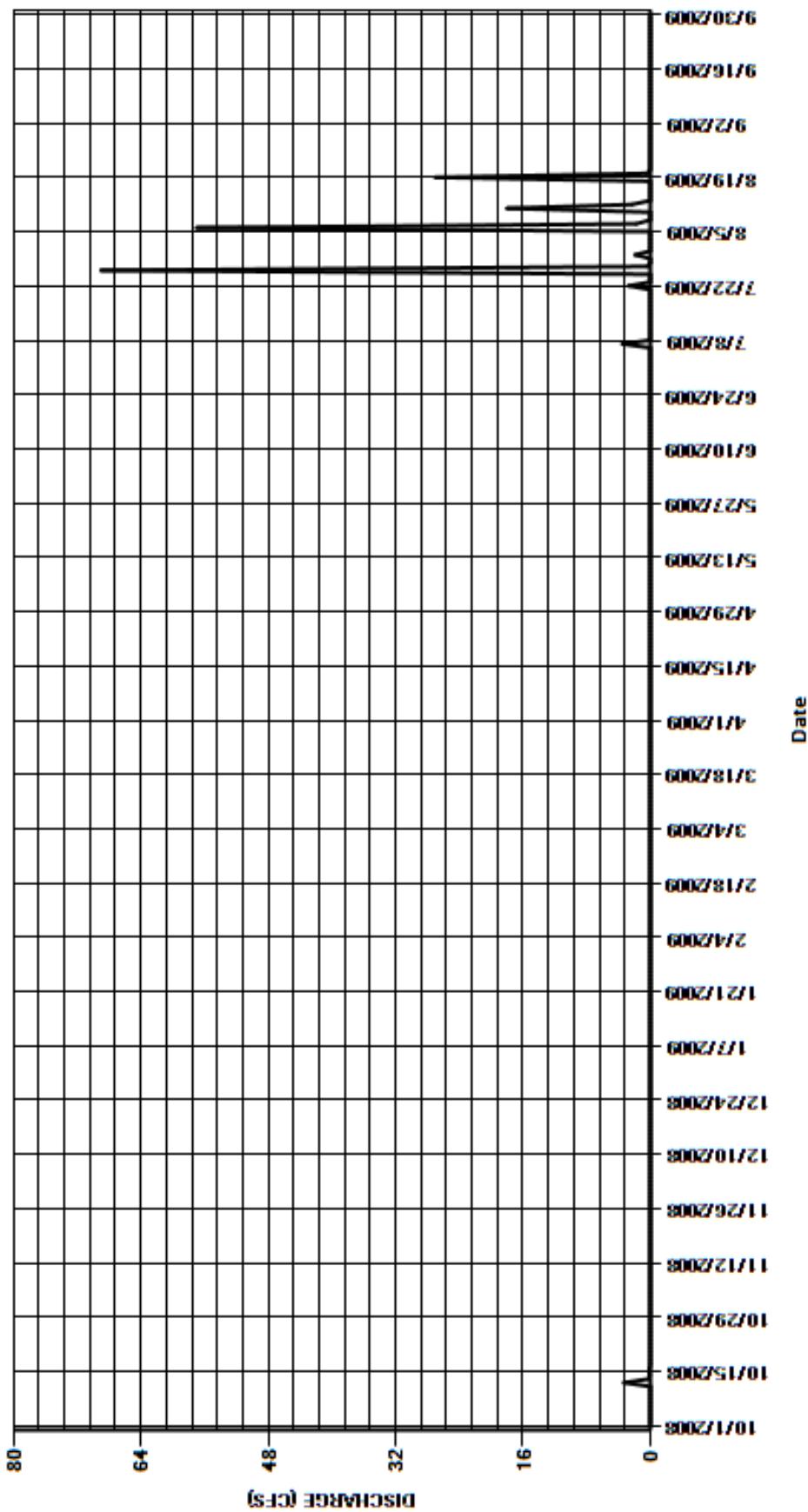
CAL YR	2008	TOTAL	521.94	MEAN	1.43	MAX	433	MIN	0	AC-FT	1040	
WTR YR	2009	TOTAL	187.65	MEAN	0.51	MAX	69	MIN	0	AC-FT	372	

MAX DISCH: 505 CFS AT 02:15 ON Jul. 26,2009 GH 7.07 FT. SHIFT 0 FT.

MAX GH: 7.07 FT. AT 02:15 ON Jul. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MUDY CREEK BELOW MUDY CR DAM NR TOONERVILLE, CO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO
Water Year 2009

Location.-- Lat. 37°49'12", Long. 103°10'55" (Toonerville, Colorado quadrangle, 1:24000 scale) in the NW $\frac{1}{4}$ Sec.6, T26S, R51W, Bent County on the downstream side of a bridge abutment at the crossing of Highway 101 and Rule Creek approximately 920 feet below the confluence of Muddy and Rule Creek.

Drainage and Period of Record.-- 196.08 sq. mi. The gage was established in the 1970's. It is unknown at this time how long the station was operated before it was abandoned. The station was reopened in the October of 2004 utilizing the existing stilling well.

Equipment.-- High data rate Sutron SatLink Logger DCP and Sutron Accububble mounted on the north side of the Highway 101 bridge over Rule Creek. Primary reference gage is a drop wire weight gage installed on the Hwy 101 bridge rail above the orifice line termination. No changes were made this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. The gage height record is complete and reliable, except for the following periods: Dec 2, 9-20. 2008, Jan 5-6, 15-17, Feb 9, Mar 14, 27-29, 31, 2009, when gage heights were not indicative of actual flow. Generally during these periods, gage heights would have indicated some small flow, whereas numerous site visits observed no flow throughout the time periods involved.

Datum Corrections.-- Levels were last run on July 19, 2007. No corrections were needed or made. An abbreviated level loop was run on July 30, 2007, to shoot in the RP for a wire weight reference gage.

Rating.-- Control is a downstream riffle which creates a small pool at the gage. At higher stages the control becomes the channel and includes the brush-lined riverbanks. Flows are contained by the bridge immediately upstream of the gage. Rating No. 1, developed Jun 30, 2006 was used for entire water year. Eleven discharge observations were made this water year, all observations of no flow. The estimated peak discharge of 1940 cfs occurred at 0730 on Jul 26, 2009, at a gage height of 9.79 ft with a shift of 0.46 ft. The peak gage height exceeded Rating No. 1. The peak discharge was estimated by a straight line extension of the upper end of Rating No. 1. Since all eleven measurements observed no flow, the peak exceeded all measurements.

Discharge.-- Shifting control method was used for periods of good record. The variable shift curve, RULTOOCOSC08, based on WY20008 record, was used the entire year.

Special Computations.--

Remarks.-- Record should be considered poor. The flashy nature and remote location of the gage make it extremely difficult to maintain a reliable stage-discharge relationship. Station maintained and record developed by Adam Adame .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO

RATING TABLE--

RULTOOCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	2	0.08
2	0	0	0	0	0	0	0	0	0	0	0.72	0.32
3	0	0	0	0	0	0	0	0	0	0	0.12	0.47
4	0	0	0	0	0	0	0	0	0	0	0	0.53
5	0	0	0	0	0	0	0	0	0	0.21	0	0.07
6	0	0	0	0	0	0	0	0	0	0.23	118	0
7	0	0	0	0	0	0	0	0	0	0	19	0
8	0	0	0	0	0	0	0	0	0	3	6.3	0
9	0	0	0	0	0	0	0	0	0	2	2.2	0
10	0	0	0	0	0	0	0	0	0	0.61	0.75	0
11	0.16	0	0	0	0	0	0	0	0	0.09	0.24	0
12	4.1	0	0	0	0	0	0	0	0	0	8.8	0
13	5.2	0	0	0	0	0	0	0	0	0	4.6	0
14	1.8	0	0	0	0	0	0	0	0	0	1.3	0
15	0.91	0	0	0	0	0	0	0	0	0	0.25	0
16	1.1	0	0	0	0	0	0	0	0	0	0	0
17	0.58	0	0	0	0	0	0	0	0	0	0	0
18	0.02	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	7.6	0
20	0	0	0	0	0	0	0	0	0	0	12	0
21	0	0	0	0	0	0	0	0	0	0	5.8	0.23
22	0	0	0	0	0	0	0	0	0	0	2.3	0.06
23	0	0	0	0	0	0	0	0	0	0	0.81	0
24	0	0	0	0	0	0	0	0	0	0	0.1	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	325	0.07	0
27	0	0	0	0	0	0	0	0	0	0	18	0.02
28	0	0	0	0	0	0	0	0	0	0	6.5	0
29	0	0	0	0	---	0	0	0	0	0	2.9	0
30	0	0	0	0	---	0	0	0	0	0	2.3	0
31	0	---	0	0	---	0	---	0	0	---	4.4	0
TOTAL	13.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.24	192.98	1.76
MEAN	0.45	0	0	0	0	0	0	0	0	11.8	6.23	0.059
AC-FT	28	0	0	0	0	0	0	0	0	724	383	3.5
MAX	5.2	0	0	0	0	0	0	0	0	325	118	0.53
MIN	0	0	0	0	0	0	0	0	0	0	0	0

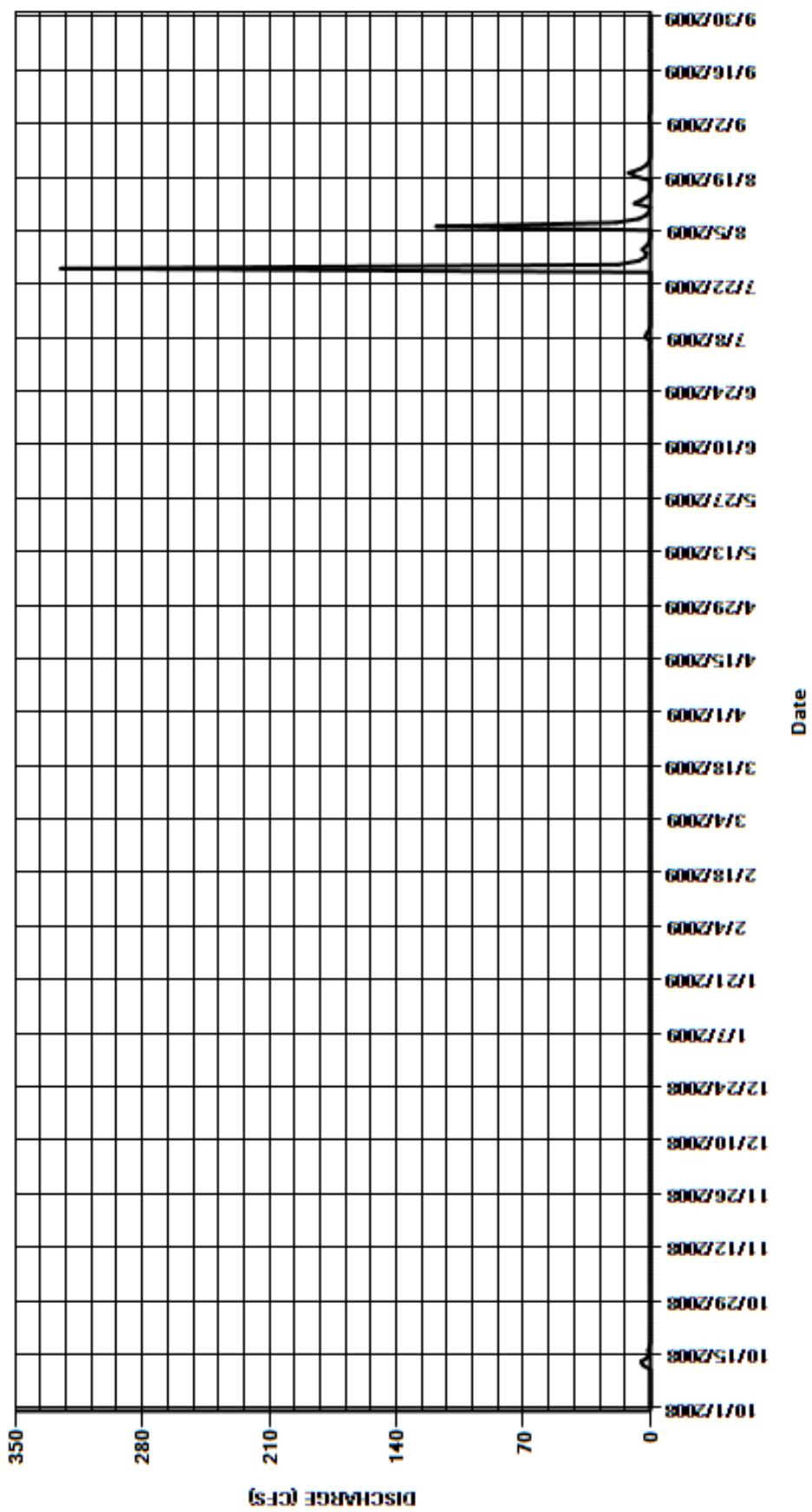
CAL YR	2008	TOTAL	1164.20	MEAN	3.18	MAX	812	MIN	0	AC-FT	2310
WTR YR	2009	TOTAL	573.85	MEAN	1.57	MAX	325	MIN	0	AC-FT	1140

MAX DISCH: 1940 CFS AT 07:30 ON Jul. 26,2009 GH 9.79 FT. SHIFT 0.46 FT.

MAX GH: 9.79 FT. AT 07:30 ON Jul. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
09061500 COLUMBINE DITCH NEAR FREMONT PASS
Water Year 2009

Location.-- Lat. 39°22'25", Long. 106°13'38". Columbine ditch diverts water from tributaries of Eagle River in sec. 5, T.8 S., R. 79 W., in Colorado River basin to Chalk Creek (tributary to East Fork Arkansas River) in NW $\frac{1}{4}$ sec. 9, T.8 S., R 79 W., in Arkansas River basin.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (DCP) and shaft encoder in a 30" diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 6-foot steel Parshall flume. No changes in equipment this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute DCP log data with satellite data and the graphic chart recorder used for backup purposes. Record is complete and reliable.

Datum Corrections.-- Levels were last run on July 31, 2007. Leveling confirmed that the elevation of the outside staff gage was well within allowable limits, so no corrections were needed/taken.

Rating.-- A standard 6 ft. Parshall flume table (COLDITCO01, dated June 22, 1971) was used this water year. No measurements were obtained this WY given the short runs of water and variable gage heights. The peak flow of 8.46 cfs occurred at 1900 May 16, 2009 at a gage height of 0.50 ft with a shift of 0.02 ft.

Discharge.-- Measurements are made from a walkway across the flume at a section even with the staff gage and well intake. Shifts were distributed by stage using a shift curve, COLUMVSHF09A developed from previous water years. This flume does have a considerable amount of lateral settling away from the gage house/inlet. This is the reasoning for the lower end of the shift curve as the stilling well very seldom drains and shows approximately 0.05 ft of gage height with no flow in the flume.

Special Computations.-- Due the flume not being level laterally, flow at all gage heights between 0.00 and 0.05 ft are set to 0 cfs.

Remarks.-- This gage typically has a more constant and predictable run of water but unfortunately the operation of this water year gage made it very difficult to obtain measurements. Record fair. Station maintained and record developed by Cheston Hart.

Recommendations.-- Depending on the future of this flume, consideration should be given to either reinstalling the flume or pouring a false bottom in the flume to level the floor.

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09061500 COLUMBINE DITCH NEAR FREMONT PASS

RATING TABLE--

COLDITCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	1.1	0	0
2	0	0	0	0	0	0	0	0	0.28	2	0	0
3	0	0	0	0	0	0	0	0	0.2	1.7	0	0
4	0	0	0	0	0	0	0	0	0.07	0.12	0	0
5	0	0	0	0	0	0	0	0	0	1	0	0
6	0	0	0	0	0	0	0	0	0.01	1.4	0	0
7	0	0	0	0	0	0	0	0	0	1.5	0	0
8	0	0	0	0	0	0	0	0	0	1.1	0	0
9	0	0	0	0	0	0	0	0	0	0.86	0	0
10	0	0	0	0	0	0	0	0	0	0.72	0	0
11	0	0	0	0	0	0	0	0	0.03	0.72	0	0
12	0	0	0	0	0	0	0	0	0.11	0.64	0	0
13	0	0	0	0	0	0	0	0	1.2	0.53	0	0
14	0	0	0	0	0	0	0	0	0.63	0.28	0	0
15	0	0	0	0	0	0	0	0	0.28	0.02	0	0
16	0	0	0	0	0	0	0	3.2	0.5	0	0	0
17	0	0	0	0	0	0	0	4.7	0.51	0	0	0
18	0	0	0	0	0	0	0	3.6	1.1	0	0	0
19	0	0	0	0	0	0	0	0.98	0.86	0	0	0
20	0	0	0	0	0	0	0	0.85	0.85	0	0	0
21	0	0	0	0	0	0	0	0.03	0.39	0	0	0
22	0	0	0	0	0	0	0	0	0.44	0	0	0
23	0	0	0	0	0	0	0	0	0.1	0	0	0
24	0	0	0	0	0	0	0	0	0.79	0	0	0
25	0	0	0	0	0	0	0	0	0.4	0	0	0
26	0	0	0	0	0	0	0	0	0.26	0	0	0
27	0	0	0	0	0	0	0	0	0.01	0	0	0
28	0	0	0	0	0	0	0	0.08	2.1	0	0	0
29	0	0	0	0	---	0	0	0.12	0.56	0	0	0
30	0	0	0	0	---	0	0	0.1	0.18	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.66	11.86	13.69	0.00	0.00
MEAN	0	0	0	0	0	0	0	0.44	0.4	0.44	0	0
AC-FT	0	0	0	0	0	0	0	27	24	27	0	0
MAX	0	0	0	0	0	0	0	4.7	2.1	2	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

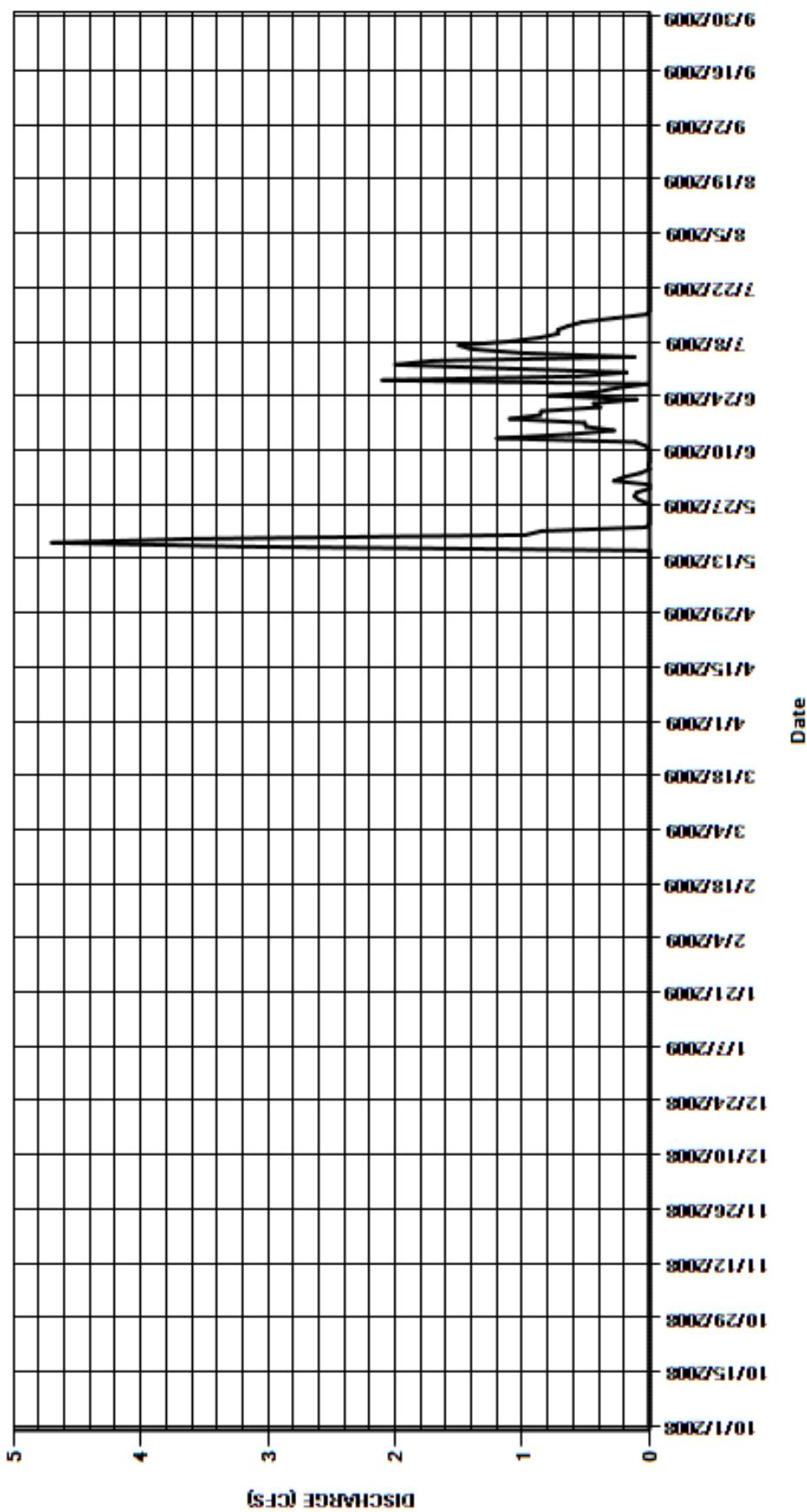
CAL YR	2008	TOTAL	43.62	MEAN	0.12	MAX	3.5	MIN	0	AC-FT	87
WTR YR	2009	TOTAL	39.21	MEAN	0.11	MAX	4.7	MIN	0	AC-FT	78

MAX DISCH: 8.5 CFS AT 19:00 ON May. 16,2009 GH 0.5 FT. SHIFT 0.02 FT.

MAX GH: 0.5 FT. AT 19:00 ON May. 16,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09061500 COLUMBINE DITCH NEAR FREMONT PASS
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
09062000 EWING DITCH AT TENNESSEE PASS
Water Year 2009

Location.-- Lat. 39°21'40", Long. 106°18'22", diverts water from Piney Creek in sec. 11, T.8 S., R.80 W., in Eagle River basin, to Thayer Gulch (tributary to Tennessee Creek) in Sec. 11, T. 8 S., R.80 W., in Arkansas River basin.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 4-foot steel Parshall flume. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. During the period April 30-May 4, after gage was started but DCP was not transmitting, data from the backup chart record were used to fill in missing record without loss of accuracy.

Datum Corrections.-- Levels were last run on July 11, 2006. No corrections were necessary.

Rating.-- A standard 4-ft. Parshall flume table (EWIDITCO02 dated June 22, 1971) was used this water year. One discharge measurement (No. 105) was made during the year on May 21, 2009. Measurement 105 discharge was 9.78 cfs. The peak flow of 14.3 cfs occurred at 2100 June 2, 2009 at a gage height of 0.96 ft with a shift of -0.03 ft. It exceeded Measurement 105 by 0.21 feet in stage.

Discharge.-- Measurements are made from a walkway across the flume at a section even with the staff gage and well intake. Shifts were applied the entire water year using variable stage shift relationship EWINGVSHF09. Measurement 105 shift was -0.02 ft. but was adjusted 3% to a shift of -0.03 ft to align with the shift curve.

Special Computations.--

Remarks.-- Record good. Station maintained and record developed by Cheston Hart.

Recommendations.-- Recommend measuring throughout the running water season across the entire range in stage.

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09062000 EWING DITCH AT TENNESSEE PASS

RATING TABLE--

STD04FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.33	0	0	0	0	0	0	1.7	12	4.7	1.8	0
2	0	0	0	0	0	0	0	1.5	13	4.5	1.6	0
3	0	0	0	0	0	0	0	1.3	13	4.4	1.6	0
4	0	0	0	0	0	0	0	1.1	13	4.1	1.5	0
5	0	0	0	0	0	0	0	0.71	13	4.1	1.4	0
6	0	0	0	0	0	0	0	2.2	12	3.8	1.5	0
7	0	0	0	0	0	0	0	3.6	12	3.6	1.4	0
8	0	0	0	0	0	0	0	3.9	11	3.4	1.3	0
9	0	0	0	0	0	0	0	4.1	11	3.2	1.3	0
10	0	0	0	0	0	0	0	4.3	10	3.1	1.2	0
11	0	0	0	0	0	0	0	5.5	9.7	3	1.2	0
12	0	0	0	0	0	0	0	6.5	9.1	2.9	1.2	0
13	0	0	0	0	0	0	0	6.7	8.7	2.8	1.2	0
14	0	0	0	0	0	0	0	6.6	8.4	2.7	1.3	0
15	0	0	0	0	0	0	0	6.3	8.1	2.6	1.5	0
16	0	0	0	0	0	0	0	6.8	7.8	2.4	1.2	0
17	0	0	0	0	0	0	0	7.6	7.6	2.3	1.1	0
18	0	0	0	0	0	0	0	9.1	7.3	2.2	1.1	0
19	0	0	0	0	0	0	0	9.7	7	2.2	1.1	0
20	0	0	0	0	0	0	0	10	7.2	2.2	1.1	0
21	0	0	0	0	0	0	0	11	6.8	2.1	1	0
22	0	0	0	0	0	0	0	11	6.5	2	0.98	0
23	0	0	0	0	0	0	0	11	6.3	1.9	0.98	0
24	0	0	0	0	0	0	0	12	6.2	1.9	1	0
25	0	0	0	0	0	0	0	12	6	1.9	0.99	0
26	0	0	0	0	0	0	0	12	5.8	2	0.98	0
27	0	0	0	0	0	0	0	11	5.6	1.9	0.95	0
28	0	0	0	0	0	0	0	11	5.4	1.9	0.92	0
29	0	0	0	0	---	0	0	11	5.2	1.8	0.89	0
30	0	0	0	0	---	0	0.72	11	4.9	1.9	0.89	0
31	0	---	0	0	---	0	---	11	---	2	0.55	---
TOTAL	0.33	0.00	0.00	0.00	0.00	0.00	0.72	223.21	259.6	85.5	36.73	0.00
MEAN	0.011	0	0	0	0	0	0.024	7.2	8.65	2.76	1.18	0
AC-FT	0.7	0	0	0	0	0	1.4	443	515	170	73	0
MAX	0.33	0	0	0	0	0	0.72	12	13	4.7	1.8	0
MIN	0	0	0	0	0	0	0	0.71	4.9	1.8	0.55	0

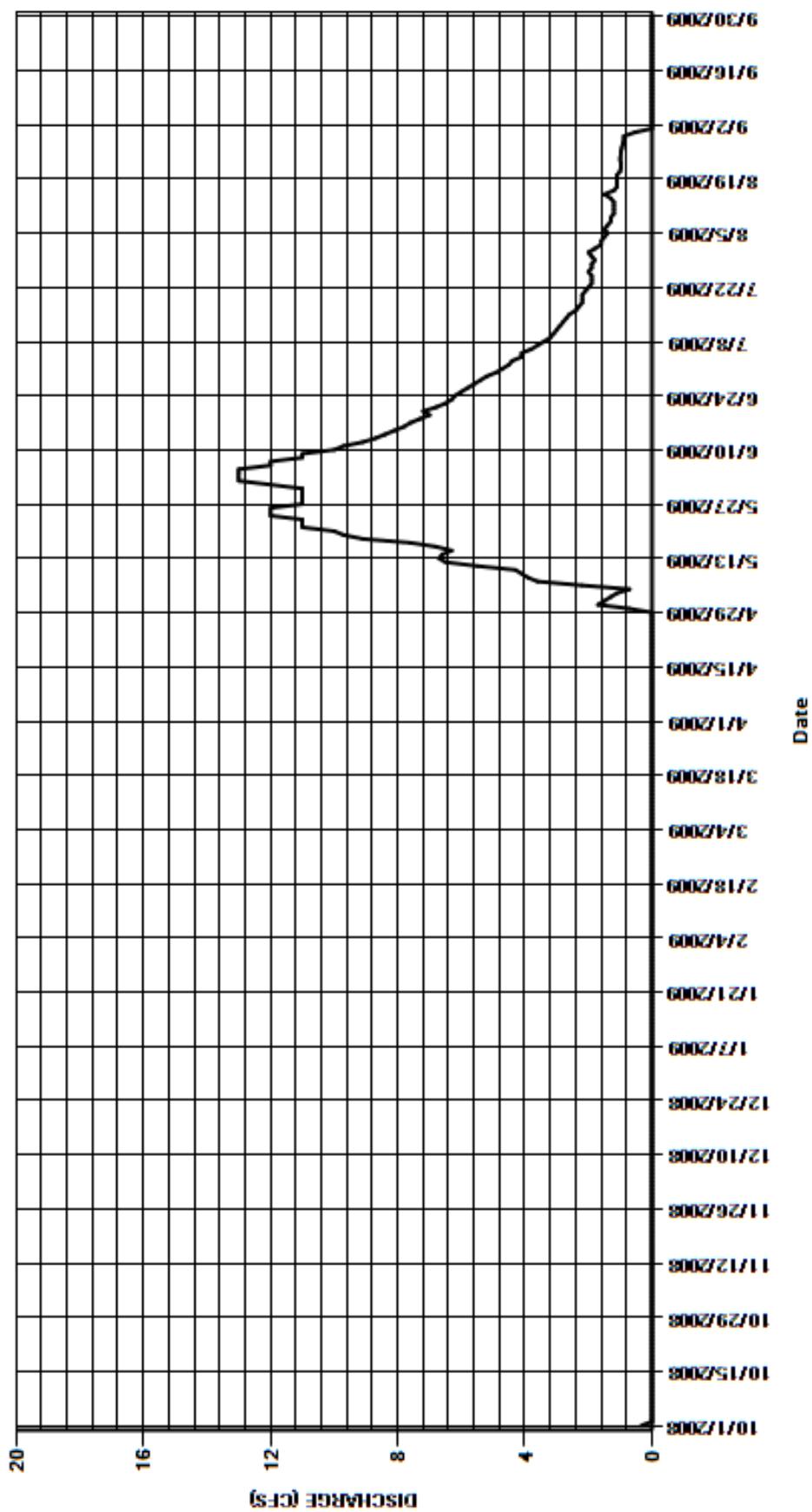
CAL YR	2008	TOTAL	727.76	MEAN	1.99	MAX	16	MIN	0	AC-FT	1440
WTR YR	2009	TOTAL	606.09	MEAN	1.66	MAX	13	MIN	0	AC-FT	1200

MAX DISCH: 14 CFS AT 21:00 ON Jun. 02,2009 GH 0.96 FT. SHIFT -0.03 FT.

MAX GH: 0.96 FT. AT 21:00 ON Jun. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09062000 EWING DITCH AT TENNESSEE PASS
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
09062500 WURTZ DITCH NEAR TENNESSEE PASS
Water Year 2009

Location.-- Lat. 39°21'15", Long. 106°21'09"; diverts water from tributaries of Eagle River in Colorado River basin to West Tennessee Creek (tributary to Tennessee Creek) in sec. 17, T.8 S., R.80 W., in Arkansas River basin.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 6-foot steel Parshall flume. No changes to the equipment were made this water year.

Hydrographic Conditions.--

Gage-Height Record.-- The primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable, except as follows: April 29, 30, May 1-4 in which the gage height was affected by ice within the flume. Checks between the primary and backup records agreed within +/- 0.02 feet.

Datum Corrections.-- Levels were run Sept 23, 2008. The flume floor at the staff gage is the primary reference (Elv. 0.00) and it was found to be within acceptable limits, thus no datum corrections were implemented this water year.

Rating.-- A standard 6-ft. Parshall flume table (WURDITCO01 dated June 22, 1971) was used this water year. One discharge measurement (No. 97) was made this water year on May 12, 2009. Measured discharge was 19.6 cfs. The peak flow of 56 cfs occurred at 2130 May 18, 2009 at a gage height of 1.66 ft. with a shift of +0.04 ft. It exceeded the stage of measurement no. 97 by 0.77 feet.

Discharge.-- Measurements are made from a walkway across the flume at a section even with the staff gage and well intakes. Shifts were distributed by stage for the entire water year using variable stage-shift relationship WURDITCOSH08, which is based on current and historical measurements. Measurement No. 97 was discounted -8% to the historical shift curve.

Special Computations.-- Ice effected days were determined from chart data and site visits. In the first few days this gage was operating, large amounts of slush and ice caused the ice effected days and these days were estimated to fit the daily hydrograph.

Remarks.-- Record is good, except for the days of ice effect which are considered poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- More measurements are recommended for this gauge. Additionally a field sheet needs to be in gage and filled out by those who visit the gage and maintain the chart data. Consideration should be given to correcting the lateral slope found in the flume floor.

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09062500 WURTZ DITCH NEAR TENNESSEE PASS

RATING TABLE--

WURDITCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.24	0	0	0	0	0	0	8.9	40	8.7	0	0
2	0	0	0	0	0	0	0	7.2	37	8.5	0	0
3	0	0	0	0	0	0	0	6.1	41	9	0	0
4	0	0	0	0	0	0	0	4.1	36	7.9	0	0
5	0	0	0	0	0	0	0	3.7	31	7.7	0	0
6	0	0	0	0	0	0	0	4.3	30	7.9	0	0
7	0	0	0	0	0	0	0	7.9	27	6.1	0	0
8	0	0	0	0	0	0	0	11	22	5.3	0	0
9	0	0	0	0	0	0	0	12	21	4.8	0	0
10	0	0	0	0	0	0	0	12	20	4.4	0	0
11	0	0	0	0	0	0	0	13	21	4.1	0	0
12	0	0	0	0	0	0	0	21	19	4.1	0	0
13	0	0	0	0	0	0	0	23	19	4.6	0	0
14	0	0	0	0	0	0	0	24	20	4.7	0	0
15	0	0	0	0	0	0	0	28	18	3.7	0	0
16	0	0	0	0	0	0	0	29	17	1.4	0	0
17	0	0	0	0	0	0	0	32	17	0	0	0
18	0	0	0	0	0	0	0	38	17	0	0	0
19	0	0	0	0	0	0	0	40	16	0	0	0
20	0	0	0	0	0	0	0	38	18	0	0	0
21	0	0	0	0	0	0	0	38	20	0	0	0
22	0	0	0	0	0	0	0	40	17	0	0	0
23	0	0	0	0	0	0	0	39	15	0	0	0
24	0	0	0	0	0	0	0	43	15	0	0	0
25	0	0	0	0	0	0	0	37	15	0	0	0
26	0	0	0	0	0	0	0	34	15	0	0	0
27	0	0	0	0	0	0	0	29	14	0	0	0
28	0	0	0	0	0	0	0	27	12	0	0	0
29	0	0	0	0	---	0	1.4	27	11	0	0	0
30	0	0	0	0	---	0	6	32	9.6	0	0	0
31	0	---	0	0	---	0	---	34	---	0	0	---
TOTAL	0.24	0.00	0.00	0.00	0.00	0.00	7.40	743.2	630.6	92.90	0.00	0.00
MEAN	0.008	0	0	0	0	0	0.25	24	21	3	0	0
AC-FT	0.5	0	0	0	0	0	15	1470	1250	184	0	0
MAX	0.24	0	0	0	0	0	6	43	41	9	0	0
MIN	0	0	0	0	0	0	0	3.7	9.6	0	0	0

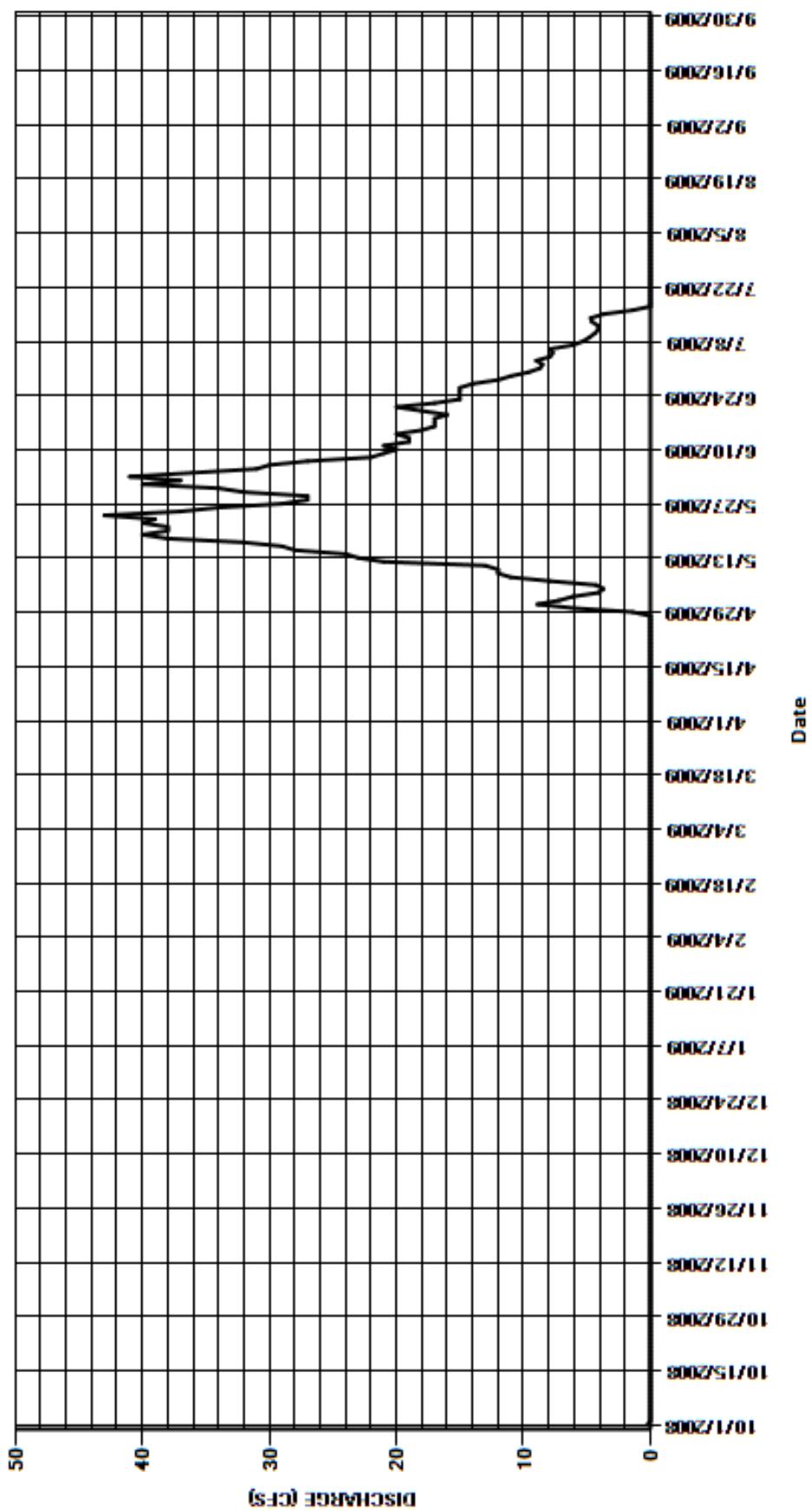
CAL YR	2008	TOTAL	644.75	MEAN	1.76	MAX	19	MIN	0	AC-FT	1280
WTR YR	2009	TOTAL	1474.34	MEAN	4.04	MAX	43	MIN	0	AC-FT	2920

MAX DISCH: 56 CFS AT 21:30 ON May. 18,2009 GH 1.66 FT. SHIFT 0.04 FT.

MAX GH: 1.66 FT. AT 21:30 ON May. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09062500 WURTZ DITCH NEAR TENNESSEE PASS
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN

WURTZ EXTENSION

Water Year 2009

Location.-- Lat. 39°23'41", Long. 106°21'10", sec. 32, T.7 S., R.80 W., Eagle County.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, Sutron high data rate SatLink Logger satellite-monitored data collection platform and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 6-foot, steel Parshall flume. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with the DCP log and graphic chart recorder used for backup purposes. Record is complete and reliable.

Datum Corrections.-- No levels were run this year. Levels and a flume inspection were done on Sep 23, 2008. No corrections due to levels were necessary.

Rating.-- The control is a standard, 6-ft. steel Parshall flume. Rating No. 1 (WUREXDCO01), dated June 22, 1971, was used this water year. One discharge measurement, (No. 31) was made during the year with a discharge of 3.98 cfs. There were many no and lower flow days and higher flow days of May 15 thru June 22 2009. The peak flow of 17.8 cfs occurred at 2345 on June 2, 2009 at a gage height of 0.84 ft. with a shift of -0.01 ft. It exceeded the stage of measurement no. 31, made June 25, 2009, by 0.52 ft.

Discharge.-- Measurements are made from a walkway across the flume at a section even with the staff gage and well intake. Shifts were distributed by stage for the entire year using variable stage-shift relationship, WUREXVSHF09, which is based on the past several years of discharge measurement history.

Special Computations.--

Remarks.-- Record good. Station maintained and record developed by Cheston Hart.

Recommendations.-- Field sheet needs to be placed in gage house to note any changes during water year.

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WURTZ EXTENSION

RATING TABLE--

WUREXDCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.08	0	0	0	0	0	0	0	12	2.2	0	0
2	0	0	0	0	0	0	0	0	13	2.1	0	0
3	0	0	0	0	0	0	0	0	14	2.3	0	0
4	0	0	0	0	0	0	0	0	12	2	0	0
5	0	0	0	0	0	0	0	0	10	2.1	0	0
6	0	0	0	0	0	0	0	0	10	2.1	0	0
7	0	0	0	0	0	0	0	0	9	1.6	0	0
8	0	0	0	0	0	0	0	1.1	7.8	1.4	0	0
9	0	0	0	0	0	0	0	2.3	7.2	1.3	0	0
10	0	0	0	0	0	0	0	1.9	6.8	1.1	0	0
11	0	0	0	0	0	0	0	2.3	7.2	1.1	0	0
12	0	0	0	0	0	0	0	3.7	6.4	1	0	0
13	0	0	0	0	0	0	0	3.7	5.9	1.4	0	0
14	0	0	0	0	0	0	0	4	5.9	1.2	0	0
15	0	0	0	0	0	0	0	4.6	5.5	0.97	0	0
16	0	0	0	0	0	0	0	5.2	5.3	0.33	0	0
17	0	0	0	0	0	0	0	6	5	0	0	0
18	0	0	0	0	0	0	0	7.2	4.7	0	0	0
19	0	0	0	0	0	0	0	7.4	4.5	0	0	0
20	0	0	0	0	0	0	0	7.8	4.9	0	0	0
21	0	0	0	0	0	0	0	8.6	5.3	0	0	0
22	0	0	0	0	0	0	0	10	4.4	0	0	0
23	0	0	0	0	0	0	0	10	3.9	0	0	0
24	0	0	0	0	0	0	0	12	3.7	0	0	0
25	0	0	0	0	0	0	0	10	3.8	0	0	0
26	0	0	0	0	0	0	0	11	3.8	0	0	0
27	0	0	0	0	0	0	0	9.7	3.5	0	0	0
28	0	0	0	0	0	0	0	8.8	3	0	0	0
29	0	0	0	0	---	0	0	8.6	2.7	0	0	0
30	0	0	0	0	---	0	0	10	2.5	0	0	0
31	0	---	0	0	---	0	---	10	---	0	0	---
TOTAL	0.08	0.00	0.00	0.00	0.00	0.00	0.00	165.90	193.7	24.20	0.00	0.00
MEAN	0.003	0	0	0	0	0	0	5.35	6.46	0.78	0	0
AC-FT	0.2	0	0	0	0	0	0	329	384	48	0	0
MAX	0.08	0	0	0	0	0	0	12	14	2.3	0	0
MIN	0	0	0	0	0	0	0	0	2.5	0	0	0

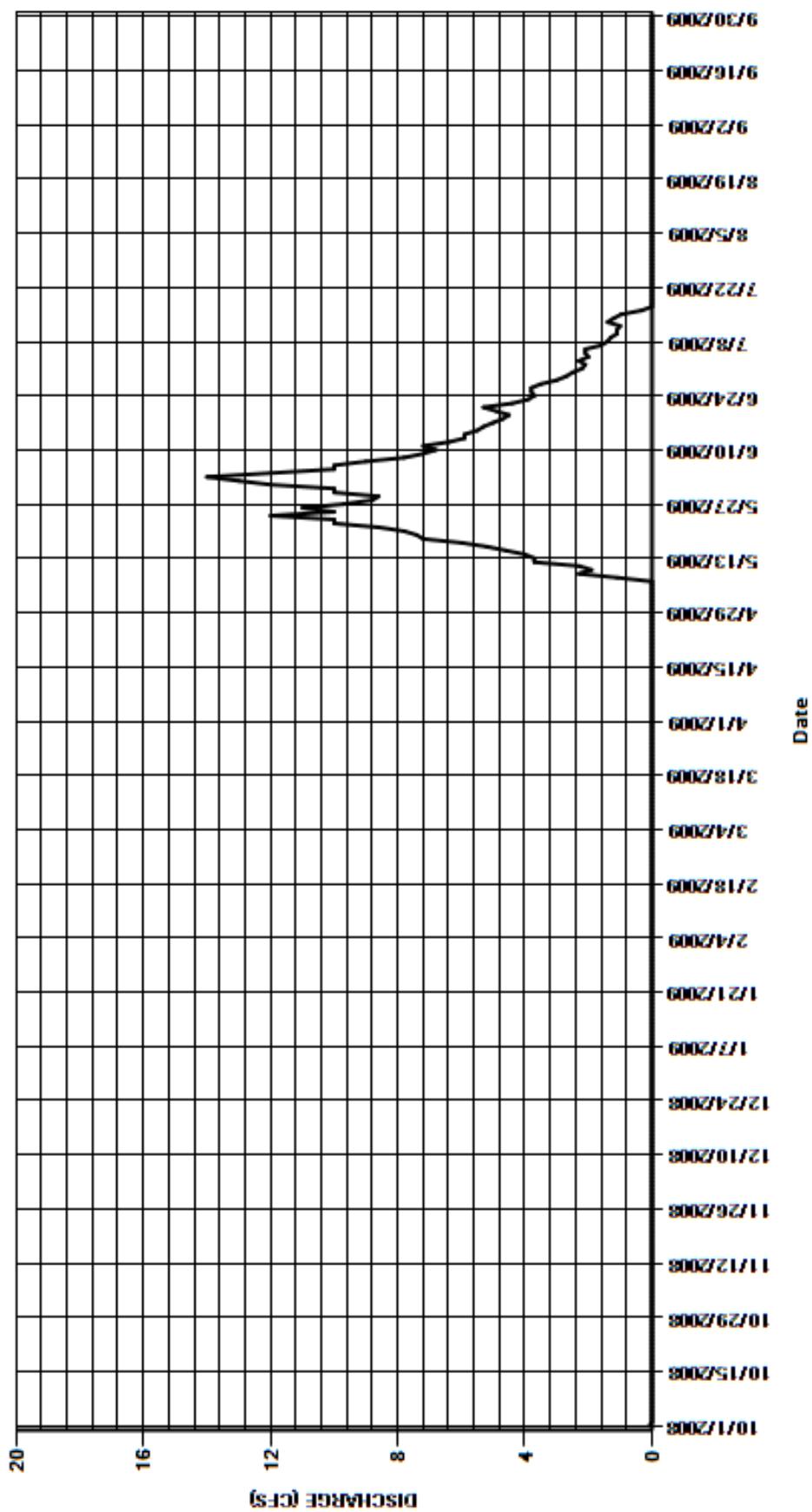
CAL YR	2008	TOTAL	492.01	MEAN	1.34	MAX	15	MIN	0	AC-FT	976
WTR YR	2009	TOTAL	383.88	MEAN	1.05	MAX	14	MIN	0	AC-FT	761

MAX DISCH: 18 CFS AT 23:45 ON Jun. 02,2009 GH 0.84 FT. SHIFT -0.01 FT.

MAX GH: 0.84 FT. AT 23:45 ON Jun. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WURTZ EXTENSION
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
09063700 HOMESTAKE TUNNEL
Water Year 2009

Location.-- Lat. 39°16'52", Long. 106°25'56"; Homestake tunnel diverts water from Homestake Lake, in sec. 17, T. 8 S., R. 81 W., in Eagle River basin, to Lake Fork Creek in Arkansas River basin.

Drainage and Period of Record.-- N/A.

Equipment.-- Graphic water-stage recorder, high-data rate satellite-monitored data collection platform (DCP) and shaft encoder in a 4 ft x 4 ft wood shelter and concrete well. Shaft encoder and chart are set to inside electric tape gage and staff gage. Control is a 12-ft concrete Parshall Flume. No changes in equipment this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable.

Datum Corrections.-- Levels were last run on July 11, 2006. During this survey, Reference Mark 2 was determined unreliable and new RM5 was established (El 7.916 ft). Leveling confirmed the outside staff gage was within limits. No corrections made.

Rating.-- Control is a 12-foot concrete Parshall flume. A standard 12-ft. Parshall flume table (HOMTUNCO01 dated June 11, 1975) was used the entire water year. Two discharge measurements (No.117-118) were made during the year, ranging in discharge from 44.5 to 295 cfs. The range in daily flows during the water year was 0.00 cfs (many days) to 310 cfs. The peak flow of 312 cfs occurred at 1100 Mar.09, 2009 at a gage height of 3.19 ft. with a shift of +0.08 ft. It exceeded the stage of measurement no.117, made by 0.15 feet in stage.

Discharge.-- Measurements are made from a bridge near the intake/staff gage position. Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed using shift curve HOMTUNVSHF09, developed during the water year using measurement data from water years 2001-2009. Measurements 117 and 118 were discounted +2% and -5%, respectively, to fit the shift curve. Subsequent measurements will continue to define the stage shift relationship.

Special Computations.--

Remarks.-- Record is considered good. Station maintained and record developed by Cheston Hart.

Recommendations.-- Measurements were rated as poor given the effects of surging flow from the tunnel mouth. More research should be attempted to reduce the surge effect. ADCP measurements may help in defining the rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09063700 HOMESTAKE TUNNEL

RATING TABLE--

HOMTUNCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	297	153	215	150	0	0
2	0	0	0	0	0	120	295	152	215	150	0	0
3	0	0	0	0	0	286	293	152	215	150	39	0
4	0	0	0	0	0	285	292	88	199	150	95	0
5	0	0	0	0	0	284	291	0	189	150	95	0
6	0	0	0	0	0	283	300	0	189	149	94	0
7	0	0	0	0	0	281	309	0	189	120	36	0
8	0	0	0	0	0	281	307	0	189	97	0	0
9	0	0	0	0	0	296	306	0	189	97	0	0
10	0	0	0	0	0	310	305	0	189	97	0	0
11	0	0	0	0	0	309	303	0	189	97	0	0
12	0	0	0	0	0	308	301	0	189	98	0	0
13	0	0	0	0	0	307	299	0	189	98	0	0
14	0	0	0	0	0	306	297	0	189	71	0	0
15	0	0	0	0	0	306	295	0	189	47	0	0
16	0	0	0	0	0	306	293	0	190	47	0	0
17	0	0	0	0	0	304	292	0	190	47	0	0
18	0	0	0	0	0	303	290	0	231	48	0	0
19	0	0	0	0	0	301	288	0	298	48	0	0
20	0	0	0	0	0	300	286	0	298	48	0	0
21	0	0	0	0	0	299	283	0	298	19	0	0
22	0	0	0	0	0	298	282	0	123	0	0	0
23	0	0	0	0	0	297	280	0	0	0	0	0
24	0	0	0	0	0	295	277	0	0	0	0	0
25	0	0	0	0	0	295	276	0	0	0	0	0
26	0	0	0	0	0	293	274	0	0	0	0	0
27	0	0	0	0	0	293	206	93	0	0	0	0
28	0	0	0	0	0	291	155	213	0	0	0	0
29	0	0	0	0	---	289	154	213	0	0	0	0
30	0	0	0	0	---	294	154	215	85	0	0	0
31	0	---	0	0	---	298	---	215	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	8718.00	8280	1494.00	4636.00	1978.00	359.00	0.00
MEAN	0	0	0	0	0	281	276	48.2	155	63.8	11.6	0
AC-FT	0	0	0	0	0	17290	16420	2960	9200	3920	712	0
MAX	0	0	0	0	0	310	309	215	298	150	95	0
MIN	0	0	0	0	0	0	154	0	0	0	0	0

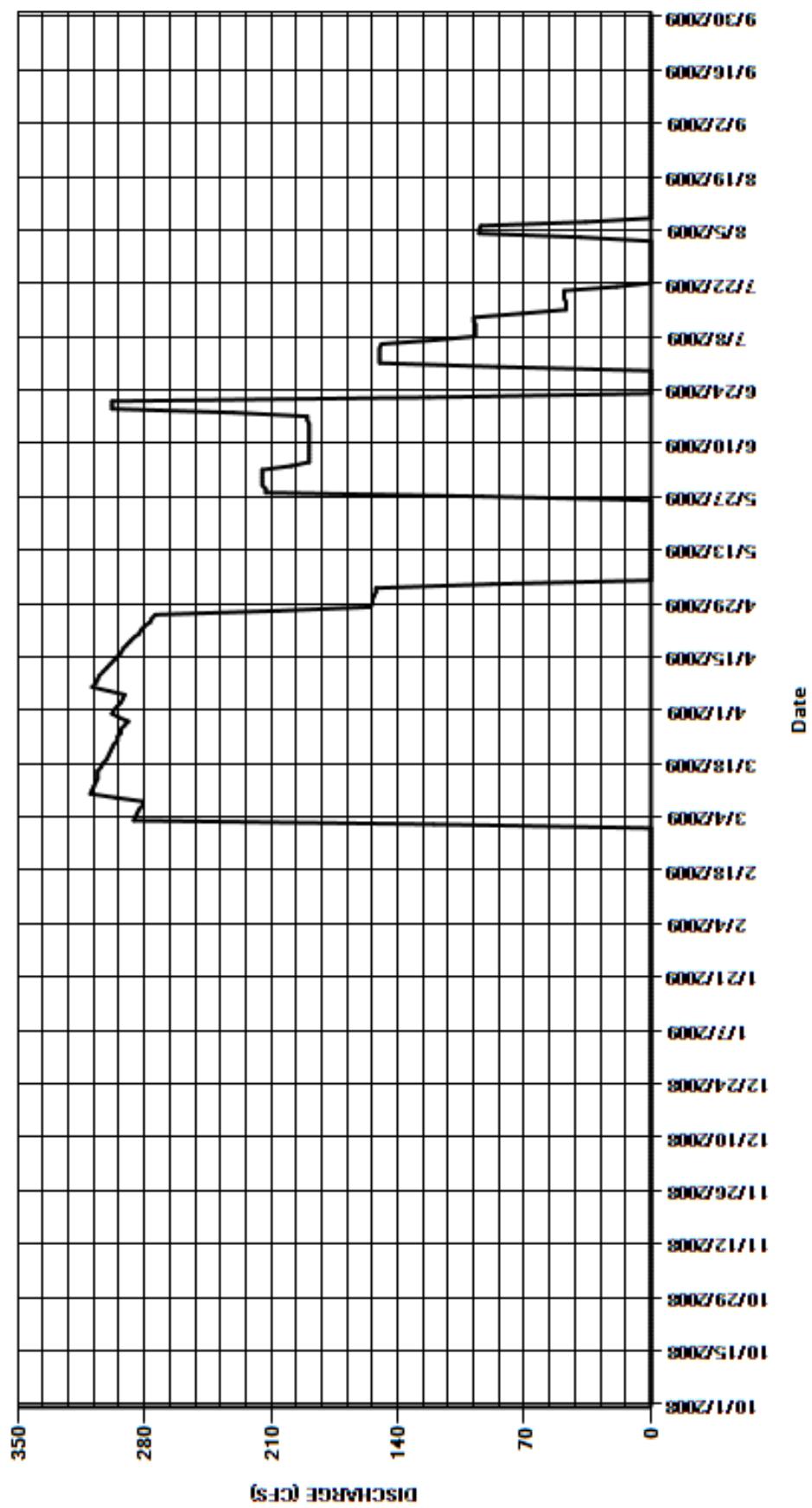
CAL YR	2008	TOTAL	13083.00	MEAN	35.7	MAX	315	MIN	0	AC-FT	25950
WTR YR	2009	TOTAL	25465.00	MEAN	69.8	MAX	310	MIN	0	AC-FT	50510

MAX DISCH: 312 CFS AT 11:00 ON Mar. 09,2009 GH 3.19 FT. SHIFT 0.08 FT.

MAX GH: 3.19 FT. AT 11:00 ON Mar. 09,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09063700 HOMESTAKE TUNNEL
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
09077160 CHARLES H. BOUSTEAD TUNNEL
Water Year 2009

Location.-- Lat. 39°16'40", Long. 106°25'40"; Charles H. Boustead Tunnel diverts water from the main stem and tributaries of Fryingpan River in Colorado River basin, to Lake Fork in sec. 10, T. 9 S., R. 81 W., in Arkansas River basin.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron 8210 DCP) and shaft encoder in a 5 ft by 5 ft concrete shelter and well. Shaft encoder and chart are set to inside electric tape gage. Outside staff gage used for supplemental reference gage. No changes this water year to equipment.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except as follows: September 15-23, 2009, water was turned out past flume through a bypass gate. It was unknown to the water operator how gate was opened.

Datum Corrections.-- Levels were last run on Aug 11, 2005. No corrections made. The gage is a very stable concrete structure.

Rating.-- A standard 15-ft. Parshall flume table (BOUTUNCO01 dated MAY 16, 1972) was used this water year. Two discharge measurements (No. 62, 63) were made during the year, ranging in discharge from 380 cfs to 521cfs. Record outside this measurement range included: lower meandarily flows during Oct 1, 2008 – May 11, 2009, July 4 – Sept 30, 2009 and higher flows May 12 – June 10, 2009 and June 13 – 29, 2009. The peak flow of 963 cfs occurred at 2145 May 18, 2009 at a gage height of 5.54 ft. with a shift of +0.26 ft. It exceeded the stage of measurement no. 62, made May 27, 2009, by 1.80 feet in stage.

Discharge.-- Shifts were distributed by stage for the entire water year of good record using shift curve BOUTUNCOVS10, which was derived from a number of previous and current year measurements. This Variable shift curve was modified this year after looking at historical measurements and attempting to fit the curve to more recent measurements. In the upcoming water year more measurements should be made to better describe this shift curve.

Special Computations.-- Flows were estimated through the period when water was diverted through a bypass gage using trends in flow before and after this event.

Remarks.-- Record is considered good except for the days that water was diverted past the flume which are estimated and are considered fair. The Boustead Tunnel Flume is located approximately 90 feet downstream of the mouth of Boustead Tunnel. Connection is by a variable width rectangular concrete channel section. Approach conditions to the flume are considered poor at stages above 2.50 feet due to high velocity and turbulent flow conditions. This results in increasingly positive shifts as stage increases. All measurements were accomplished per procedures outlined in the latest edition of the State of Colorado Hydrographic Manual unless otherwise noted. Station maintained and record developed by Cheston Hart.

Recommendations.-- Additional measurements are recommended per the Ley and Schultz report of May 28, 2004 to improve definition of the shift curve in the range of gage heights between 2.75 feet and 5.50 feet. Improvements to the measurement bridge are recommended for safety, or, installation of a bank operated cableway should be investigated.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077160 CHARLES H. BOUSTEAD TUNNEL

RATING TABLE--

BOUTUNCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.1	1.4	1.7	1.9	1.9	2.2	2.2	96	854	425	2.8	3.2
2	1.5	1.4	1.7	1.9	1.9	2.2	2.2	105	731	400	2.8	3.4
3	1.4	1.4	1.7	1.9	1.9	2.2	2.2	89	751	433	2.7	3.2
4	1.4	1.4	1.7	1.9	1.9	2.2	1.9	62	699	370	2.2	3.1
5	1.4	1.4	1.7	1.9	1.9	2.2	2.1	49	702	326	2.2	3.1
6	1.4	1.4	1.7	1.9	1.9	2.2	2.2	64	721	293	2.2	3.1
7	1.4	1.4	1.7	1.9	1.9	2.2	2.2	165	601	281	2.2	3.1
8	1.4	1.4	1.9	1.9	1.9	2.2	2.2	276	520	265	2.5	3.1
9	1.4	1.4	1.9	1.9	1.9	2.2	2.2	290	530	221	2.5	3.3
10	1.4	1.4	1.9	1.9	1.9	2.2	2.2	288	498	193	2.5	2.4
11	1.4	1.5	1.9	1.9	1.9	2.2	2.2	365	479	182	2.5	1.7
12	1.4	1.7	1.9	1.9	1.9	2.1	2.2	526	458	170	2.6	1.7
13	1.4	1.7	1.9	1.9	1.9	1.9	2.2	558	602	153	2.8	1.7
14	1.4	1.7	1.9	1.9	1.9	1.9	2.2	547	655	135	2.8	1.7
15	1.4	1.7	1.9	1.9	1.9	1.9	2.2	599	604	110	2.8	1.7
16	1.4	1.7	1.9	1.9	2	1.9	1.9	686	634	80	2.9	1.7
17	1.4	1.7	1.9	1.9	2.2	1.9	1.9	788	668	73	3.1	1.7
18	1.4	1.7	1.9	1.9	2.2	1.9	1.9	867	738	61	3.1	1.7
19	1.4	1.7	1.9	1.9	2.2	1.9	1.9	862	769	51	3.1	1.7
20	1.4	1.7	1.9	1.9	2.2	1.9	1.9	871	820	43	3.1	1.7
21	1.4	1.7	1.9	1.9	2.2	1.9	2.8	872	840	41	3.1	1.7
22	1.4	1.7	1.9	1.9	2.2	1.9	7.9	844	842	36	3.1	1.7
23	1.4	1.7	1.9	1.9	2.2	1.9	16	848	833	19	3.1	1.7
24	1.4	1.7	1.9	1.9	2.2	1.9	27	906	825	15	3.1	1.7
25	1.4	1.7	1.9	1.9	2.2	1.9	28	784	861	8.4	3.1	1.7
26	1.4	1.7	1.9	1.9	2.2	1.9	31	615	894	2.8	3.1	1.7
27	1.4	1.7	1.9	1.9	2.2	1.9	24	556	809	2.8	3.1	1.7
28	1.4	1.7	1.9	1.9	2.2	2	23	622	593	2.8	3.2	1.7
29	1.4	1.7	1.9	1.9	---	2.1	30	704	504	2.8	3.4	1.7
30	1.4	1.7	1.9	1.9	---	2.2	64	827	450	2.8	3.3	1.8
31	1.4	---	1.9	1.9	---	2.2	---	875	---	2.8	3.1	---
TOTAL	44.2	47.8	57.5	58.9	56.9	63.3	295.8	16606	20485	4401.2	88.1	65.1
MEAN	1.43	1.59	1.85	1.9	2.03	2.04	9.86	536	683	142	2.84	2.17
AC-FT	88	95	114	117	113	126	587	32940	40630	8730	175	129
MAX	2.1	1.7	1.9	1.9	2.2	2.2	64	906	894	433	3.4	3.4
MIN	1.4	1.4	1.7	1.9	1.9	1.9	1.9	49	450	2.8	2.2	1.7

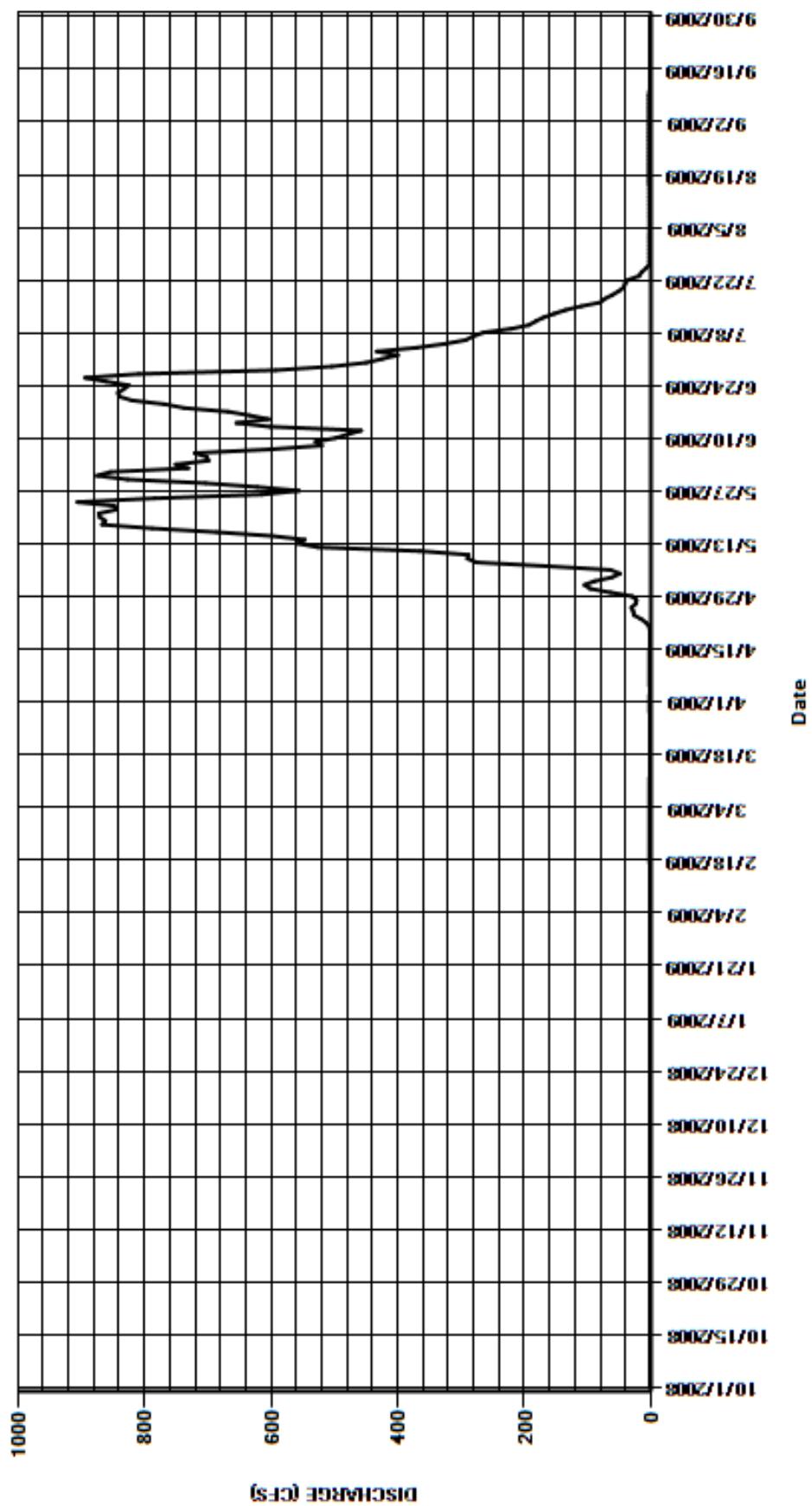
CAL YR	2008	TOTAL	45727.01	MEAN	125	MAX	952	MIN	0.34	AC-FT	90700
WTR YR	2009	TOTAL	42269.8	MEAN	116	MAX	906	MIN	1.4	AC-FT	83840

MAX DISCH: 963 CFS AT 21:45 ON May. 18,2009 GH 5.54 FT. SHIFT 0.26 FT.

MAX GH: 5.54 FT. AT 21:45 ON May. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077160 CHARLES H. BOUSTEAD TUNNEL
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
09077500 BUSK-IVANHOE TUNNEL
Water Year 2009

Location.-- Lat. 39°14'55", Long. 106°28'14"; Water diverted from Ivanhoe Lake, tributary to Fryingpan River in sec. 13, T. 9 S., R. 82 W., in Roaring Fork River Basin, to Busk Creek (tributary to Lake Fork) in sec. 20, T. 9 S., R. 81 W., in Arkansas River Basin.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 3' x 3' metal & wood shelter and well. Primary record is satellite-monitored data with the graphic chart recorder used for backup purposes. Shaft encoder and chart recorder are set to outside staff gage. Control is an 8-foot steel Parshall flume. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable.

Datum Corrections.-- Levels were not run this year.

Rating.-- A standard 8-ft. Parshall flume table (BUSTUNCO02 dated October 1, 1970) was used the entire water year. Two discharge measurements (Nos. 101, 102) ranging in discharge from 4.49 to 8.10 cfs were made during the water year. There were many lower daily flows on Oct 1, 2008- May 9, 2009; June 26 - July 10, July 13, and July 19 - Sept 30, 2009; and higher mean daily flows on May 12 – June 19, 22, 23, 2009. The peak flow of 38.4 cfs occurred at 1830 May 24, 2009 at a gage height of 1.08 ft with a shift of +0.04 ft. It exceeded the stage of measurement no. 101, made June 17, 2009, by 0.63 feet in stage.

Discharge.-- Shifting control method was used the entire water year. Shifts were distributed by stage for the entire water year using variable stage-shift relationship BUSTUNCOSH09, which is based on current and previous water year measurements. Measurement 101 and 102 were discounted from -9% to 8% in order to fit historical shift curve.

Special Computations.--

Remarks.-- Record good. The gage was shut down and equipment removed on Sept 18, 2009. The gage was rebuilt and a new Parshall Flume was installed. Station maintained and record developed by Cheston Hart.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077500 BUSK-IVANHOE TUNNEL

RATING TABLE--

BUSTUNCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

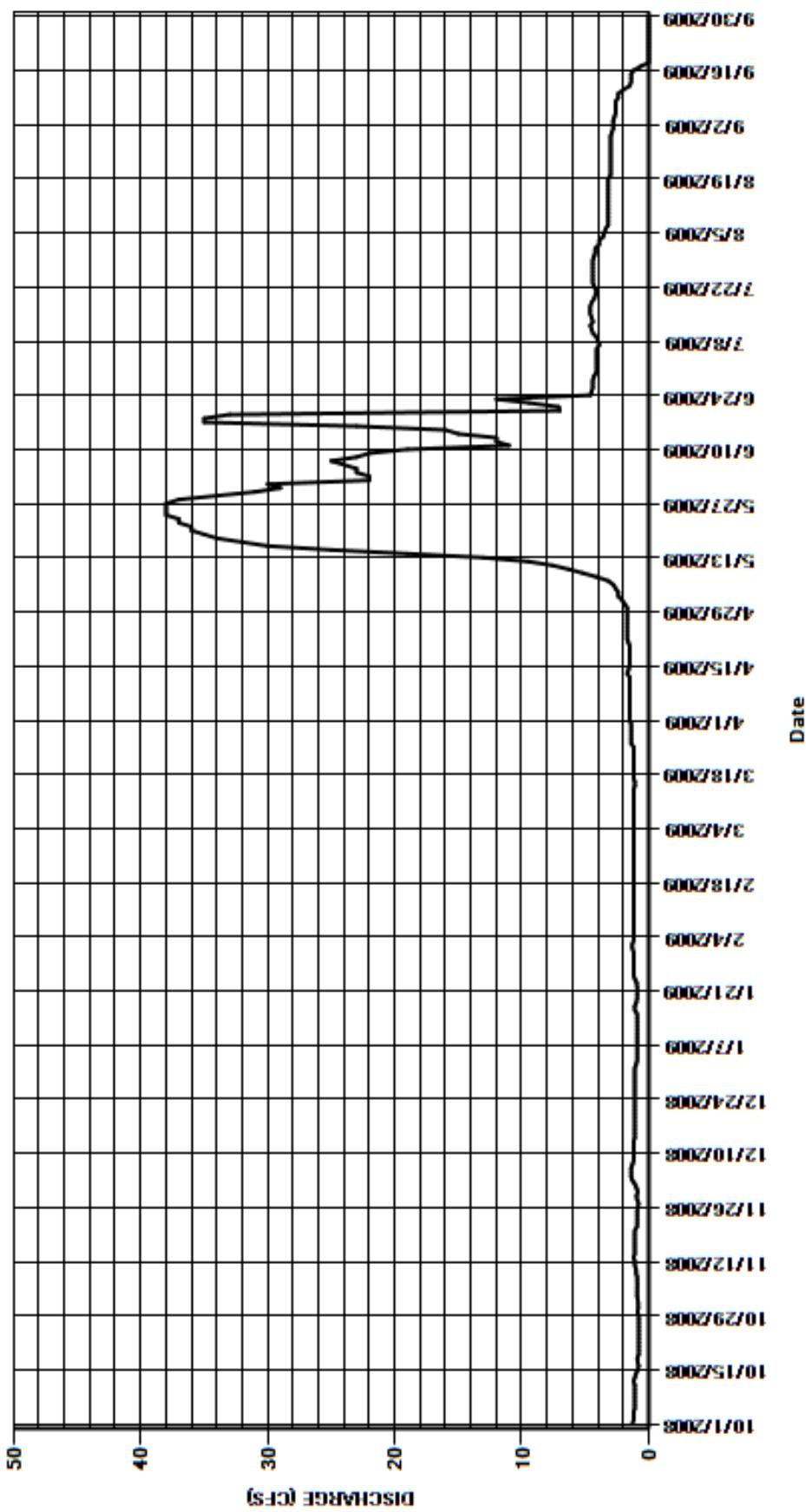
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	0.83	0.97	1.1	1.3	1.2	1.5	1.9	30	4.1	4.2	2.8
2	1.2	0.86	1.1	0.99	1.3	1.2	1.5	2.1	22	4.1	3.9	2.8
3	1.2	0.92	1.3	0.92	1.2	1.2	1.5	2.4	22	4.1	3.9	2.8
4	1.2	0.92	1.4	0.92	1.2	1.2	1.5	2.4	23	4.1	3.6	2.7
5	1.1	0.91	1.4	0.92	1.2	1.2	1.5	2.6	23	4.1	3.5	2.6
6	1.1	0.89	1.4	0.92	1.2	1.2	1.5	2.8	24	4.1	3.4	2.6
7	1.1	0.92	1.3	0.92	1.2	1.2	1.5	3.2	25	3.9	3.2	2.6
8	1.1	0.92	1.2	0.92	1.2	1.2	1.5	4.1	23	4	3.2	2.6
9	1.1	1	1.2	0.92	1.2	1.2	1.5	5.2	22	4.1	3.2	2.4
10	1.1	1	1.2	0.92	1.2	1.2	1.5	6.3	19	4.4	3.2	2.4
11	1.1	1.1	1.2	0.91	1.2	1.2	1.5	7.6	11	4.5	3.2	2
12	1.2	1.1	1.2	0.92	1.2	1.2	1.5	9.5	12	4.6	3.2	1.5
13	1.1	1.2	1.2	0.92	1.2	1.2	1.7	13	12	4.4	3.2	1.4
14	1	1.1	1.1	0.92	1.2	1.2	1.6	19	15	4.5	3.2	1.4
15	0.85	1.1	1.1	0.93	1.2	1.1	1.5	25	16	4.6	3.2	1.4
16	0.8	1.1	1.1	1.1	1.2	1.1	1.5	30	23	4.6	3.2	1.2
17	0.88	1.1	1.1	1.1	1.2	1.2	1.5	32	35	4.6	3.2	0.66
18	0.9	1.1	1.1	0.98	1.2	1.2	1.5	34	35	4.5	3.2	0
19	0.79	1.1	1.1	0.92	1.2	1.2	1.5	35	33	4.3	3.2	0
20	0.79	1.1	1.1	0.92	1.2	1.2	1.5	36	7	4.2	3	0
21	0.79	0.93	1.1	0.92	1.2	1.2	1.6	36	7.1	4.1	3	0
22	0.79	0.92	1.1	0.92	1.2	1.2	1.7	37	9.4	4.3	3	0
23	0.79	0.92	1.1	0.95	1.2	1.2	1.7	37	12	4.4	3	0
24	0.79	0.92	1.1	1.1	1.2	1.2	1.7	38	4.6	4.4	3	0
25	0.79	0.92	1.1	1.2	1.2	1.2	1.7	38	4.5	4.4	3	0
26	0.79	0.87	1.1	1.2	1.2	1.4	1.7	38	4.4	4.4	3	0
27	0.79	0.8	1.1	1.2	1.2	1.4	1.7	38	4.4	4.4	3	0
28	0.79	0.92	1.1	1.2	1.2	1.4	1.7	37	4.4	4.4	3	0
29	0.8	0.96	1.1	1.2	---	1.4	1.7	34	4.3	4.4	3	0
30	0.89	0.87	1.1	1.2	---	1.4	1.7	31	4.1	4.3	3	0
31	0.82	---	1.1	1.2	---	1.4	---	29	---	4.2	2.9	---
TOTAL	29.74	29.30	35.87	31.36	33.8	38.2	47.2	667.1	491.2	133.5	100.0	35.86
MEAN	0.96	0.98	1.16	1.01	1.21	1.23	1.57	21.5	16.4	4.31	3.23	1.2
AC-FT	59	58	71	62	67	76	94	1320	974	265	198	71
MAX	1.3	1.2	1.4	1.2	1.3	1.4	1.7	38	35	4.6	4.2	2.8
MIN	0.79	0.8	0.97	0.91	1.2	1.1	1.5	1.9	4.1	3.9	2.9	0
CAL YR	2008	TOTAL	2436.71	MEAN	6.66	MAX	40	MIN	0.79	AC-FT	4830	
WTR YR	2009	TOTAL	1673.13	MEAN	4.58	MAX	38	MIN	0	AC-FT	3320	

MAX DISCH: 38 CFS AT 18:30 ON May. 24,2009 GH 1.08 FT. SHIFT 0.04 FT.

MAX GH: 1.08 FT. AT 18:30 ON May. 24,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077500 BUSK-IVANHOE TUNNEL
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
09073000 TWIN LAKES TUNNEL
Water Year 2009

Location.-- Lat. 39°04'56", Long. 106°32'24"; diverts water from tributaries of Roaring Fork River in Colorado River Basin to North Fork Lake Creek in sec. 22, T.11 S., R.82 W., in Arkansas River Basin.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (DCP) and shaft encoder in a 5 ft x 5 ft concrete shelter and well. Shaft encoder and chart are set to inside electric tape gage. An outside staff gage is used for supplemental reference. Control is a 12-foot concrete Parshall flume. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete, but can be considered unreliable at low water due to the drain pipe usage as a de-icing mechanism. Usage of drain valve this year did not seem to affect GH and did help in decreasing ice effect. Ice effected the gage height January 5 and 6, 2009. Gage work effected the record on September 24, 2009.

Datum Corrections.-- Levels were last run on Oct 22, 2007. A tape length correction was made.

Rating.-- A standard 12-ft. Parshall flume table (STD12FTP) was used the entire water year. Two discharge measurements (Nos. 99-100) ranging in discharge from 93.9 to 490 cfs were made during the year. They cover the range in stage experienced except for many low flow days of Oct 1, 2008 thru May 1, 4 and 6, 2009; July 16, 18 thru September 30 2009, and higher flows of May 17-24; July 20, 23, 25-27, 2009. The peak flow pf 620 cfs occurred at 0215 May 21, 2009 at a gage height of 5.03 ft with a shift of 0.00 ft. It exceeded the mean stage of measurement no. 100, made June 18th, 2009 by 0.79 feet in stage. High flow measurements are made with a bridge crane. For measurement purposes a stay pipe is installed at the staff gage/ intake position to reduce meter and weight movement downstream. Hose clamps on the stay pipe were used to control the position of the cable and reduce meter and weight lateral movement caused by the extreme turbulence in the measurement section.

Discharge.-- Shifting control method was used for the entire water year. Shifts were distributed by stage using the variable stage-shift relationship TWINVSHF09 for the entire water year, which is based upon measurement trends of several years.

Special Computations.-- Flows on ice affected days and days when gage work was being done were estimated using partial day good record and flow trends before and after affected days.

Remarks.-- Record is good, except during periods of ice effect and gage work, which are estimated and poor. An ADVM was installed by the Twin Lakes Reservoir and Canal Company inside the tunnel, but up to this point the data are unusable for any comparisons. Station maintained and record developed by Cheston Hart.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09073000 TWIN LAKES TUNNEL

RATING TABLE--

STD12FTP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

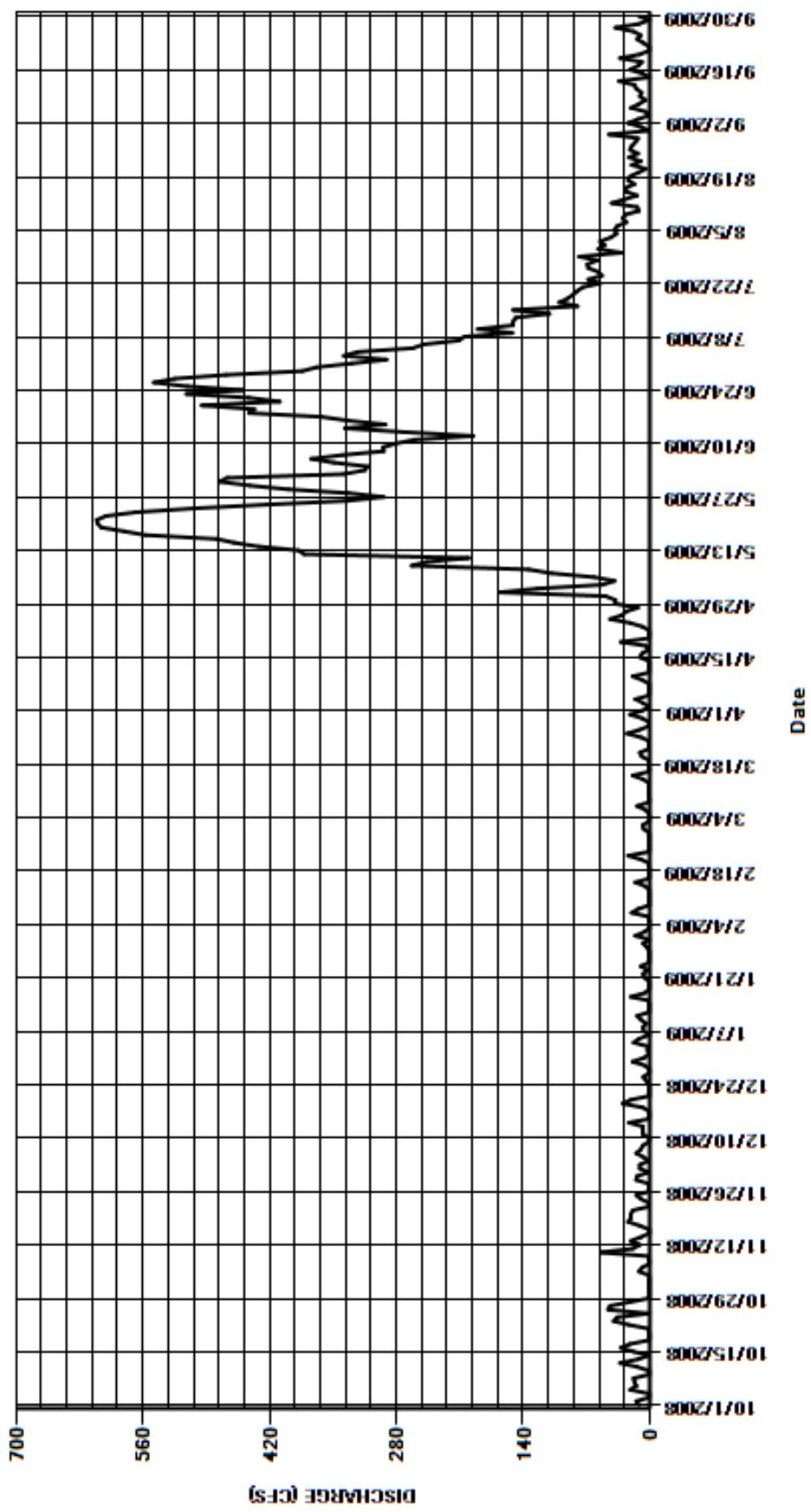
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	0.66	0.97	0.94	16	6.8	8.4	49	467	329	50	9.9
2	15	0.66	11	2.5	6	7.8	0.82	166	338	291	55	24
3	0.67	0.67	11	1.7	0.66	0.82	7.4	124	315	338	43	13
4	0.66	0.82	0.99	18	0.67	0.85	16	52	312	323	37	0.83
5	22	12	7.2	12	0.67	0.95	0.82	39	349	262	39	4.6
6	15	8.6	15	0.71	1.4	4.9	0.83	62	374	250	36	21
7	17	0.82	9.9	6.8	20	14	0.83	109	339	211	26	12
8	18	0.98	7.7	7.5	13	0.83	0.82	134	294	205	30	4.7
9	0.66	1.1	0.82	4.1	0.66	0.92	8	263	295	152	27	11
10	0.66	54	0.82	10	0.67	0.98	19	246	281	190	12	9.1
11	14	19	7.7	14	0.67	0.99	0.82	200	260	151	14	15
12	33	11	8.1	0.66	0.69	0.99	0.82	382	195	151	42	17
13	13	21	7.5	0.65	0.81	0.99	0.82	388	272	148	28	34
14	0.85	10	23	0.66	5	7.4	0.86	432	337	111	14	0.56
15	18	0.66	0.82	1.2	16	19	11	459	292	151	26	8.1
16	32	0.66	0.75	21	0.83	0.83	8.5	479	333	80	27	22
17	22	11	0.77	5.4	0.82	0.92	0.99	557	363	100	17	13
18	0.82	24	8	0.66	0.82	0.99	4.3	581	443	91	24	8.7
19	0.82	21	30	0.67	0.9	0.98	32	606	437	85	22	33
20	0.93	21	21	0.66	0.97	8.9	0.82	610	495	80	13	11
21	1.1	19	0.61	5.6	9.8	11	0.82	611	409	74	4.3	0.66
22	23	0.99	0.66	7.4	24	0.89	0.93	601	443	55	20	0.64
23	40	0.99	0.65	2.2	0.82	0.99	7.9	568	512	68	10	7.1
24	36	10	0.66	10	0.81	0.99	22	503	450	53	23	14
25	0.82	15	4	0.66	0.83	9.6	44	423	511	57	13	10
26	46	0.89	7.3	0.66	0.82	25	31	334	548	68	22	18
27	44	0.99	0.83	0.66	0.82	11	26	294	525	69	20	38
28	22	0.99	0.82	0.66	0.83	0.86	13	333	468	58	16	12
29	0.66	15	5.4	3.3	---	0.96	38	399	384	78	13	0.52
30	0.66	14	19	7.4	---	8.5	38	442	368	31	45	12
31	0.66	---	6.4	0.66	---	22	---	476	---	57	1.2	---
TOTAL	451.97	297.48	219.37	149.01	125.97	172.63	345.50	10922	11409	4367	769.5	385.41
MEAN	14.6	9.92	7.08	4.81	4.5	5.57	11.5	352	380	141	24.8	12.8
AC-FT	896	590	435	296	250	342	685	21660	22630	8660	1530	764
MAX	46	54	30	21	24	25	44	611	548	338	55	38
MIN	0.66	0.66	0.61	0.65	0.66	0.82	0.82	39	195	31	1.2	0.52
CAL YR	2008	TOTAL	31691.72	MEAN	86.6	MAX	620	MIN	0.61	AC-FT	62860	
WTR YR	2009	TOTAL	29614.84	MEAN	81.1	MAX	611	MIN	0.52	AC-FT	58740	

MAX DISCH: 620 CFS AT 02:15 ON May. 21,2009 GH 5.03 FT. SHIFT 0 FT.

MAX GH: 5.03 FT. AT 02:15 ON May. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09073000 TWIN LAKES TUNNEL
WY2009 HYDROGRAPH



ARKANSAS RIVER BASIN
LARKSPUR DITCH AT MARSHALL PASS
Water Year 2009

Location.-- Lat. $38^{\circ}23'00''$, Long. $106^{\circ}15'00''$, diverts water from tributaries of Tomichi Creek between headgates (in sec. 11, T.48 N., R.6 E., and sec. 1, T.47 N., R.6 E.), and Marshall Pass, in Gunnison River Basin, to Poncha Creek (tributary to South Arkansas River) in SE $\frac{1}{4}$ sec. 24, T.48 N., R.6 E., in Arkansas River Basin.

Drainage and Period of Record.-- N/A

Equipment.-- High data rate Sutron SatLink Logger DCP and shaft encoder with an SDR recorder in a 36 in x 36 in metal shelter and well. Control is a 2-foot steel Parshall flume with the shaft encoder and SDR set to outside staff gage.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite-monitored data with the SDR log used for backup purposes. The record is complete and fairly reliable, except for Oct 11-12, 2008 when the gage and/or flume was affected by ice. During May 19-26, 2009 the shaft encoder failed and backup data using the SDR log were used without loss of accuracy.

Datum Corrections.-- No levels were run this water year. Levels were last run on July 25, 2006 and no corrections were required.

Rating.-- A standard, 2 ft. Parshall flume rating table (STD02FTPF) was used for the entire water year. One discharge measurement, No. 49, was made during the year. The minimum daily flow was 0 cfs on many days. Mean daily flows exceeded measurement No. 49 on May 19 – July 19; July 30 – Sept 30, 2009; and was below measurement No. 49 Oct 1-15; 2008, July 19, 30,31, and Aug 1 – Sept 30, 2009. Peak discharge of 5.12 cfs occurred at 1630 June 20, 2009 at a gage height of 0.75 ft with a shift of 0.00 ft. The maximum gage height exceeded the stage of measurement No. 49 by 0.55 ft.

Discharge.-- Measurements were made from a walkway across the flume at a section even with the staff gage and well intake. Measurement 49 showed a shift of 0.00 ft. The discharge record was computed by direct application of the rating to the gage height record.

Special Computations.-- Flows during ice affected periods were estimated using partial day good record and good record before and after affected periods.

Remarks.-- Record is fair except ice effected days which are considered poor. Station maintained and record developed by Cheston Hart .

Recommendations.-- Three measurements per water year should be made since this is a record gage – one at the beginning of the water season and one at the middle/end of the season. A measurement should also be made near the diurnal peak to cover the range in stage. A temperature sensor would be helpful to estimate ice effected days. A field sheet should also be put in gage and noted for each time the gage is visited by DWR staff and ditch personnel. The flume should be completely inspected in WY10 to confirm levelness, staff gage location, pzf, etc.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LARKSPUR DITCH AT MARSHALL PASS

RATING TABLE--

STD02FTP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.48	0	0	0	0	0	0	0	3.6	1.8	0.5	0.24
2	0.45	0	0	0	0	0	0	0	3.5	2.2	0.45	0.25
3	0.43	0	0	0	0	0	0	0	3.5	1.9	0.41	0.28
4	0.47	0	0	0	0	0	0	0	3.4	1.5	0.4	0.26
5	0.49	0	0	0	0	0	0	0	3.3	1.4	0.38	0.38
6	0.49	0	0	0	0	0	0	0	3.3	1.3	0.38	0.44
7	0.44	0	0	0	0	0	0	0	3.1	1.2	0.36	0.33
8	0.45	0	0	0	0	0	0	0	2.9	1.1	0.35	0.29
9	0.45	0	0	0	0	0	0	0	2.9	1.1	0.36	0.31
10	0.46	0	0	0	0	0	0	0	2.9	1.1	0.34	0.33
11	0.42	0	0	0	0	0	0	0	2.9	1.1	0.31	0.34
12	0.45	0	0	0	0	0	0	0	2.8	1.1	0.3	0.41
13	0.51	0	0	0	0	0	0	0	2.7	1.3	0.29	0.54
14	0.66	0	0	0	0	0	0	0	2.7	1	0.41	0.34
15	0.45	0	0	0	0	0	0	0	2.6	0.85	0.39	0.34
16	0	0	0	0	0	0	0	0	2.5	0.78	0.34	0.52
17	0	0	0	0	0	0	0	0	2.4	0.74	0.32	0.38
18	0	0	0	0	0	0	0	0	2.4	0.7	0.32	0.36
19	0	0	0	0	0	0	0	0	2.3	0.66	0.31	0.35
20	0	0	0	0	0	0	0	0	2.8	3	0.81	0.27
21	0	0	0	0	0	0	0	0	3.5	2.7	0.81	0.23
22	0	0	0	0	0	0	0	0	4	2.3	0.85	0.21
23	0	0	0	0	0	0	0	0	3.9	2.2	0.76	0.25
24	0	0	0	0	0	0	0	0	4.3	2.2	0.68	0.42
25	0	0	0	0	0	0	0	0	3.8	2.5	0.74	0.36
26	0	0	0	0	0	0	0	0	3.7	2.9	0.99	0.34
27	0	0	0	0	0	0	0	0	3.8	2.4	0.8	0.3
28	0	0	0	0	0	0	0	0	3.6	2	0.79	0.26
29	0	0	0	0	---	0	0	0	3.4	1.9	0.76	0.25
30	0	0	0	0	---	0	0	0	3.3	1.7	0.63	0.26
31	0	---	0	0	---	0	0	---	3.7	---	0.6	0.25
TOTAL	7.10	0.00	0.00	0.00	0.00	0.00	0.00	46.70	81.5	32.05	10.32	11.41
MEAN	0.23	0	0	0	0	0	0	1.51	2.72	1.03	0.33	0.38
AC-FT	14	0	0	0	0	0	0	93	162	64	20	23
MAX	0.66	0	0	0	0	0	0	4.3	3.6	2.2	0.5	0.56
MIN	0	0	0	0	0	0	0	0	1.7	0.6	0.21	0.24

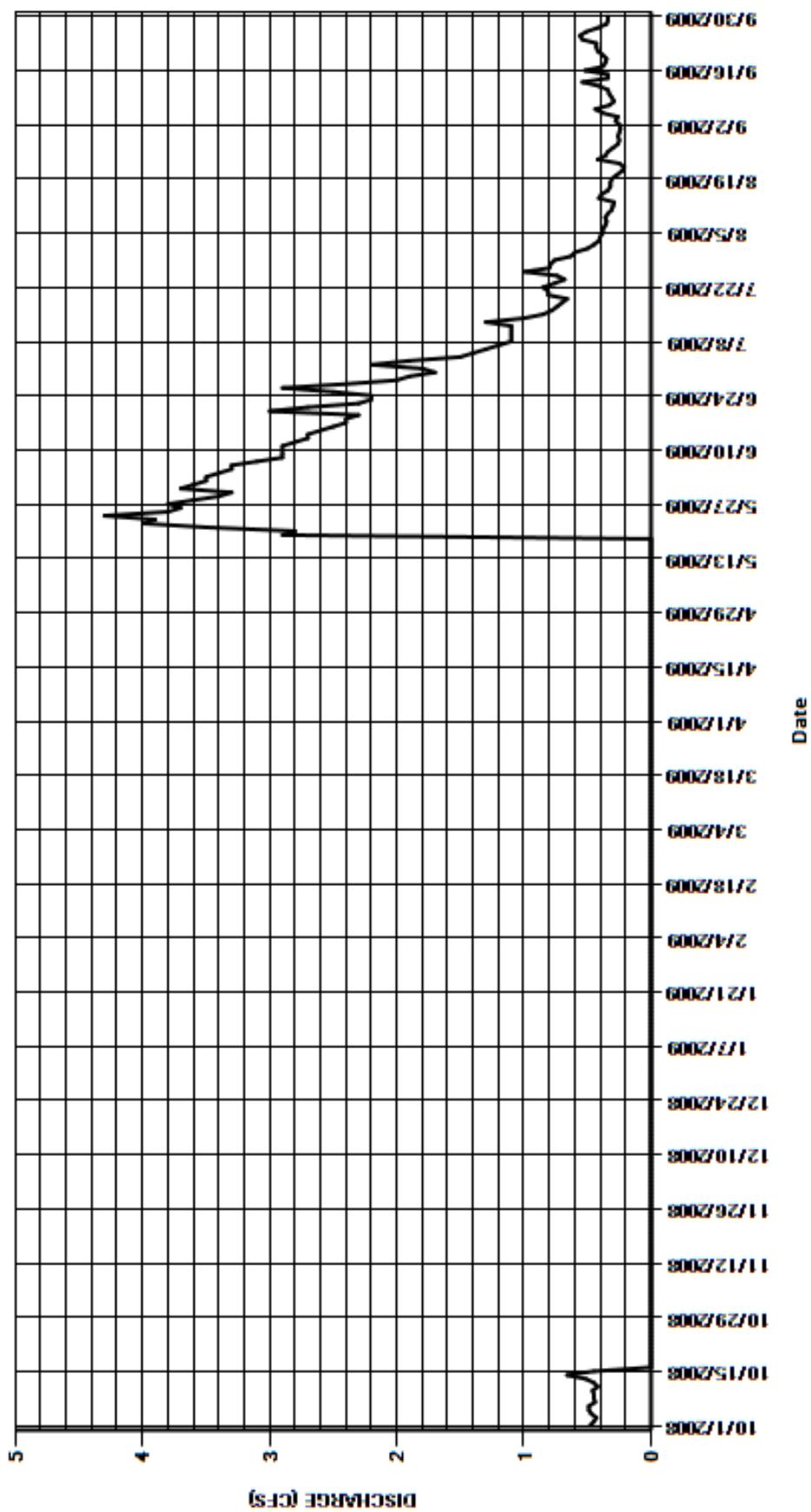
CAL YR	2008	TOTAL	229.33	MEAN	0.63	MAX	4.9	MIN	0	AC-FT	455
WTR YR	2009	TOTAL	189.08	MEAN	0.52	MAX	4.3	MIN	0	AC-FT	375

MAX DISCH: 5.1 CFS AT 16:30 ON Jun. 20,2009 GH 0.75 FT. SHIFT 0 FT.

MAX GH: 0.75 FT. AT 16:30 ON Jun. 20,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LARKSPUR DITCH AT MARSHALL PASS
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE
Water Year 2009

Location.-- Lat. $37^{\circ}43'29''$, Long. $107^{\circ}15'18''$, UTM X 301212.5, Y 4177667.8, in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 13, T.40 N., R.4 W., Hinsdale County, Hydrologic Unit 13010001, on right bank 70 ft downstream from bridge, 500 ft upstream from Squaw Creek, 0.7 mi downstream from Rio Grande Reservoir, and 20 mi southwest of Creede.

Drainage and Period of Record.-- 163 mi 2 . June 1909 to Sep. 1923, May 1925 to current year. No winter records 1910, 1926. Monthly data only for some periods.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 3 ft. by 3 ft. timber shelter and corrugated metal well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. The cableway is located 21 feet upstream of gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 5-11, 2008, March 20-29, 2009 when the station was isolated, April 5-7, 2009 when the well was frozen, and Nov. 12, 2008 to March 19, 2009 when the station was closed for the winter. There were two instrumentation corrections made to the shaft encoder, -0.01 and +0.01 feet. These corrections were prorated by time from previous visit. There was a flush correction of +0.02 ft that was run straight back to the last change in discharge from the reservoir.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage August 19, 2009 using R. M. No. 2 as base. The RP elevation was within allowable limits so no corrections were made or required. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Control is a boulder and cobble channel. Scour, fill and moss growth cause shifting. Rating No. 12, in use since Oct. 1, 1994, was used again this year. The rating is well defined from 8 to 2500 cfs. Fourteen measurements (Nos. 817-830) were made this year ranging in discharge from 3.13 to 1200 cfs. They cover the range of daily flows experienced. The peak flow of 1270 cfs occurred at 03:45 on May 8, 2009 at a gage-height of 3.67 feet with a shift of +0.05 feet. It exceeded high measurement No. 823 (GH = 3.60), made May 14, 2009 by 0.07 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Two variable shift curves were used to apply shifts according to stage for all periods of good record leading in to peak flow. Both shift curves were left open ended since shift curve #0802 was used through a range that was covered by the curve. The maximum gage height during the period that shift curve #0901 was used was only 0.07 feet above highest measured gage-height. During the rest of the year, shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied from -0.08 and +0.05 feet. All were given full weight except for Nos. 821, 824, and 826, which were adjusted by as much as 5% and No. 827 which was rated fair and adjusted 6% to smooth shift distribution.

Special Computations.-- Discharge when station isolated and closed for the winter was estimated using simple proration between measurements at closing and opening station. There was no change in reservoir release during the period. Discharge for period of no gage-height record due to the well being froze (Apr. 5-7, 2009) was estimated using one measurement and assuming a small change in release on Apr. 5, 2009. A hydrograph was not used for estimation since flow is regulated by Rio Grande Reservoir 0.7 mile upstream.

Remarks.-- Record is good except for periods of no gage-height record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE

RATING TABLE--

RIOMILCO12 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

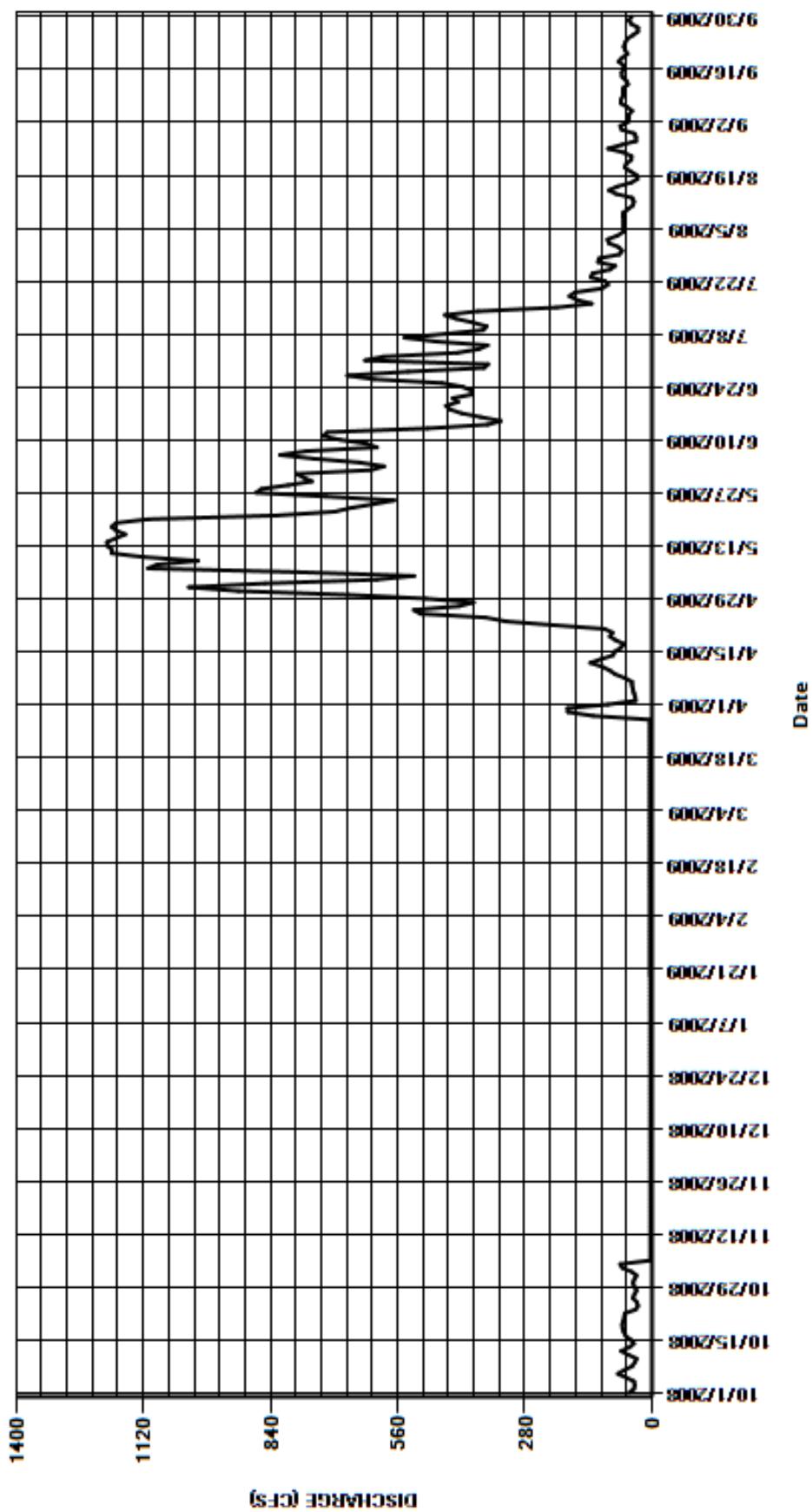
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	34	3.3	3.7	4.1	4.5	97	911	783	632	95	70
2	40	45	3.4	3.7	4.1	4.5	36	1020	619	591	98	53
3	38	65	3.4	3.8	4.1	4.5	37	852	590	429	76	51
4	40	70	3.4	3.8	4.2	4.5	40	607	644	381	63	51
5	57	3.1	3.4	3.8	4.2	4.5	42	524	744	362	63	44
6	75	3.1	3.4	3.8	4.2	4.5	44	775	819	477	63	55
7	61	3.1	3.4	3.8	4.2	4.5	44	1110	761	545	63	69
8	44	3.1	3.4	3.8	4.2	4.6	60	1090	606	455	64	68
9	38	3.1	3.4	3.8	4.2	4.6	81	1000	629	372	64	64
10	34	3.1	3.5	3.8	4.2	4.6	93	1120	687	364	53	64
11	52	3.1	3.5	3.9	4.2	4.6	110	1190	724	394	42	64
12	68	3.1	3.5	3.9	4.3	4.6	136	1190	715	431	40	53
13	50	3.1	3.5	3.9	4.3	4.6	112	1200	494	456	44	57
14	40	3.1	3.5	3.9	4.3	4.6	86	1200	362	383	79	66
15	47	3.1	3.5	3.9	4.3	4.6	82	1180	333	210	95	67
16	58	3.2	3.5	3.9	4.3	4.7	69	1160	377	133	76	64
17	62	3.2	3.5	3.9	4.3	4.7	61	1180	419	166	46	62
18	65	3.2	3.6	3.9	4.3	4.7	80	1190	444	182	32	74
19	66	3.2	3.6	4	4.3	4.7	93	1180	454	169	34	66
20	63	3.2	3.6	4	4.4	4.7	87	1110	427	111	48	54
21	61	3.2	3.6	4	4.4	4.7	105	826	439	97	60	59
22	60	3.2	3.6	4	4.4	4.7	217	698	396	104	57	62
23	36	3.2	3.6	4	4.4	4.7	323	662	397	135	46	59
24	31	3.3	3.6	4	4.4	4.7	367	613	417	131	45	55
25	34	3.3	3.6	4	4.4	4.7	510	568	463	93	63	42
26	42	3.3	3.7	4	4.4	4.7	525	718	612	81	97	31
27	39	3.3	3.7	4.1	4.4	4.7	425	872	671	119	67	31
28	34	3.3	3.7	4.1	4.5	4.7	393	860	537	116	35	46
29	39	3.3	3.7	4.1	---	130	498	801	370	72	35	51
30	42	3.3	3.7	4.1	---	185	670	749	361	66	39	44
31	39	---	3.7	4.1	---	186	---	767	---	74	67	---
TOTAL	1506	296.8	109.5	121.5	120.0	630.4	5523	28923	16294	8331	1849	1696
MEAN	48.6	9.89	3.53	3.92	4.29	20.3	184	933	543	269	59.6	56.5
AC-FT	2990	589	217	241	238	1250	10950	57370	32320	16520	3670	3360
MAX	75	70	3.7	4.1	4.5	186	670	1200	819	632	98	74
MIN	31	3.1	3.3	3.7	4.1	4.5	36	524	333	66	32	31

CAL YR	2008	TOTAL	80226.7	MEAN	219	MAX	1220	MIN	3.1	AC-FT	159100
WTR YR	2009	TOTAL	65400.2	MEAN	179	MAX	1200	MIN	3.1	AC-FT	129700

MAX DISCH: 1270 CFS AT 03:45 ON May.08,2009 GH 3.67 FT. SHIFT 0.05 FT.
 MAX GH: 3.67 FT. AT 03:45 ON May.08,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
Water Year 2009

Location.-- Lat. $37^{\circ}53'18''$, Long. $107^{\circ}12'10''$, in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, T.42 N., R.3 W., Hinsdale County, Hydrologic Unit 13010001, on left bank 100 ft downstream from bridge, 1,000 ft downstream from Continental Reservoir, and 15 mi west of Creede.

Drainage and Period of Record.-- 51.7 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 4 ft. by 4 ft. timber shelter and concrete well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. A concrete ramp flume is the control. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 12, 2008 through Apr. 23, 2009 when the station was closed for the winter. There were two instrumentation corrections applied to the shaft encoder, -0.01 ft and +0.01 ft. These corrections were prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 19, 2009 using R.M. No. 4 as base. The RP elevation was within allowable limits, so no correction was required or made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- The control is a concrete ramp flume. There is a two foot wide notch in the middle of the ramp to provide more sensitivity at very low flows. Rating No. 23 was created and used this year. It is well defined from 0 to 300 cfs. Thirteen measurements (Nos. 776-788) were made this year ranging in discharge from 0.09 to 293 cfs. The measurements cover the range experienced. The peak flow of 305 cfs occurred at 04:45 on May 9, 2009 at a gage-height of 3.22 feet with a shift of 0 feet. It exceeded high measurement No. 780 (GH = 3.18), made May 8, 2009 by 0.04 feet in stage.

Discharge.-- Shifting control method was used for all good record periods. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied from -0.02 ft to +0.03 ft. All shifts were given full weight except Nos. 779, 782, 783, which were adjusted by as much as 5%, and Nos. 786 and 788, rated fair, were adjusted by as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for period of winter no gage-height record was estimated using simple proration between measurements at closing and opening station. There was no change in release during the period. A hydrograph was not used for estimation since flow is regulated by Continental Reservoir 1,000 ft. upstream.

Remarks.-- Record is good except for periods of no gage-height record which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR

RATING TABLE--

NCLCONCO23 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

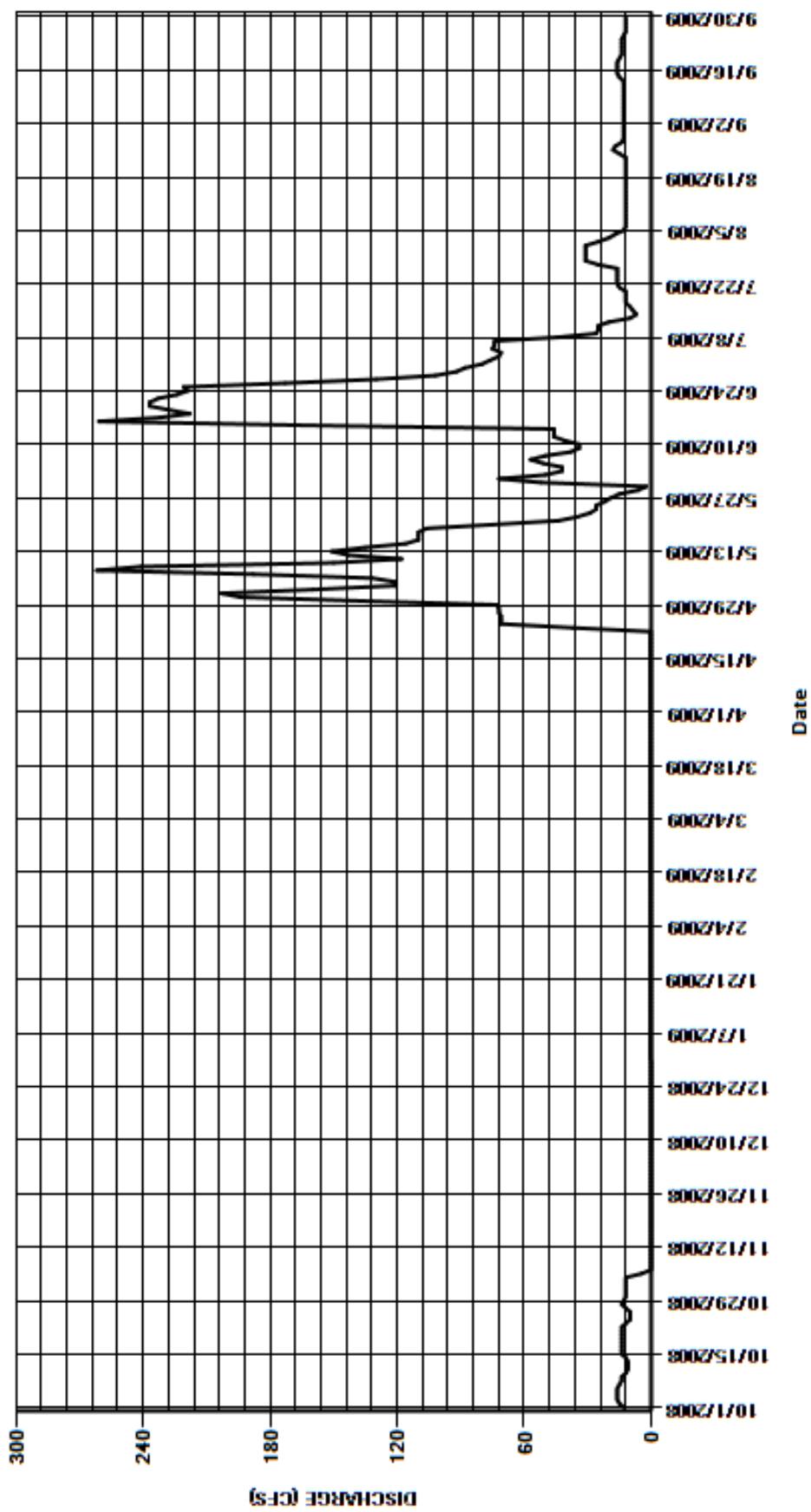
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	12	0.11	0.14	0.17	0.19	0.22	194	72	80	31	13
2	15	12	0.11	0.14	0.17	0.19	0.22	203	50	76	25	13
3	16	12	0.11	0.14	0.17	0.19	0.22	160	42	72	20	13
4	16	12	0.11	0.14	0.17	0.19	0.22	121	42	71	17	13
5	16	4.6	0.11	0.14	0.17	0.19	0.22	121	51	75	13	13
6	16	0.1	0.11	0.14	0.17	0.2	0.22	132	57	74	12	13
7	15	0.1	0.11	0.14	0.17	0.2	0.23	188	50	74	12	13
8	14	0.1	0.11	0.14	0.17	0.2	0.23	262	38	44	12	13
9	14	0.1	0.12	0.14	0.17	0.2	0.23	241	34	26	12	13
10	12	0.1	0.12	0.14	0.17	0.2	0.23	150	34	25	12	13
11	11	0.09	0.12	0.15	0.17	0.2	0.23	118	41	25	12	13
12	11	0.09	0.12	0.15	0.18	0.2	0.23	143	46	20	12	13
13	11	0.09	0.12	0.15	0.18	0.2	0.23	151	46	10	12	13
14	12	0.09	0.12	0.15	0.18	0.2	0.23	135	46	7	12	15
15	14	0.09	0.12	0.15	0.18	0.2	0.23	116	166	8.6	12	16
16	14	0.09	0.12	0.15	0.18	0.2	0.23	110	261	10	12	16
17	14	0.09	0.12	0.15	0.18	0.21	0.23	110	232	12	12	16
18	14	0.1	0.12	0.15	0.18	0.21	0.24	110	218	12	12	16
19	14	0.1	0.12	0.15	0.18	0.21	0.24	106	228	12	12	15
20	14	0.1	0.13	0.15	0.18	0.21	0.24	75	237	12	12	14
21	14	0.1	0.13	0.15	0.18	0.21	0.24	44	237	15	12	14
22	14	0.1	0.13	0.16	0.18	0.21	0.24	35	233	16	12	14
23	12	0.1	0.13	0.16	0.19	0.21	37	29	224	16	12	14
24	10	0.1	0.13	0.16	0.19	0.21	71	26	219	16	12	14
25	10	0.1	0.13	0.16	0.19	0.21	71	26	221	16	15	13
26	10	0.1	0.13	0.16	0.19	0.21	71	22	173	16	18	12
27	12	0.1	0.13	0.16	0.19	0.21	72	19	130	25	17	12
28	14	0.1	0.13	0.16	0.19	0.22	72	15	102	31	14	12
29	13	0.11	0.13	0.16	---	0.22	73	6.1	92	31	13	12
30	12	0.11	0.13	0.16	---	0.22	137	2.3	88	31	13	12
31	12	---	0.14	0.16	---	0.22	---	52	---	31	13	---
TOTAL	409	55.05	3.77	4.65	4.99	6.34	609.05	3222.4	3710	989.6	437	406
MEAN	13.2	1.84	0.12	0.15	0.18	0.2	20.3	104	124	31.9	14.1	13.5
AC-FT	811	109	7.5	9.2	9.9	13	1210	6390	7360	1960	867	805
MAX	16	12	0.14	0.16	0.19	0.22	137	262	261	80	31	16
MIN	10	0.09	0.11	0.14	0.17	0.19	0.22	2.3	34	7	12	12
CAL YR	2008	TOTAL	13032.94	MEAN	35.6	MAX	355	MIN	0.07	AC-FT	25850	
WTR YR	2009	TOTAL	9857.85	MEAN	27	MAX	262	MIN	0.09	AC-FT	19550	

MAX DISCH: 305 CFS AT 04:45 ON May. 09,2009 GH 3.22 FT. SHIFT 0 FT.

MAX GH: 3.22 FT. AT 04:45 ON May. 09,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP
Water Year 2009

Location.-- Lat. 37°46'01", Long. 106°49'51", UTM X 338690.6, Y 4181536.9, in NW1/4 NE1/4 sec. 35, T. 41N, R. 1E., Mineral County, Hydrologic unit 13010001, on left bank 40 ft. downstream from private bridge, 0.3 mi. upstream from Goose Creek, and 0.3 mi. west of town of Wagonwheel Gap.

Drainage and Period of Record.-- 780 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 4 ft. by 4 ft. timber shelter with a 4 ft. diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. The cableway is located 350 feet above gaging station. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 15-18 when the well was frozen and Dec. 19, 2008 through Mar. 11, 2009 when the station was closed for the winter. The stage-discharge relation was affected by ice Nov. 7, 28, 29, Dec. 5-14 2008. There were three instrumentation corrections made to the shaft encoder ranging from -0.01 to +0.01 feet. These corrections were prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside gage on Aug. 11, 2009 using B.M. No. 4 as base. The RP was not within allowable limits; therefore, a +0.021 ft correction was made. The datum correction was applied from this point back to when gage was opened on Mar. 11, 2009. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Low and medium water control is a wide cobble bar approximately 250 feet below the gage. High water control is the bend in the river channel approximately 350 feet below the gage. Rating #4, in use since Oct. 27, 2000, was used again this year. It is well defined from 100 to 4000 cfs. Sixteen measurements (No. 130 to 145) were made this year, ranging in discharge from 87.9 to 3450 cfs. They cover the range experienced except for the lower daily flows on Nov. 29, Dec. 10-17, 22-30, 2008, Jan. 28-31, Feb. 1-3, 16-19, 2009. The peak flow of 3880 cfs occurred at 04:15 on May 8, 2009 at a gage height of 4.69 ft. (GH corr. -0.02 ft. applied) with a shift of 0 ft. The peak flow exceeded high measurement No. 138 (GH = 4.43), (GH corr. -0.02 ft. applied), made May 8, 2009, by 0.26 ft. in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied between -0.04 and +0.06 feet. All measurements were given full weight and applied except Nos. 130, 137-139, 141, 144 and 145, which were adjusted as much as 5% to smooth shift distribution. The high measurement was adjusted to the rating since it was within 5% of the rating and the preceding and following measurements verified the accuracy of the rating.

Special Computations.-- Discharge for periods of no gage-height record was based on four measurements, partial day records, comparison with Rio Grande near Del Norte and South Fork Rio Grande near South Fork gages, and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which should be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP

RATING TABLE--

RIOWAGCO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

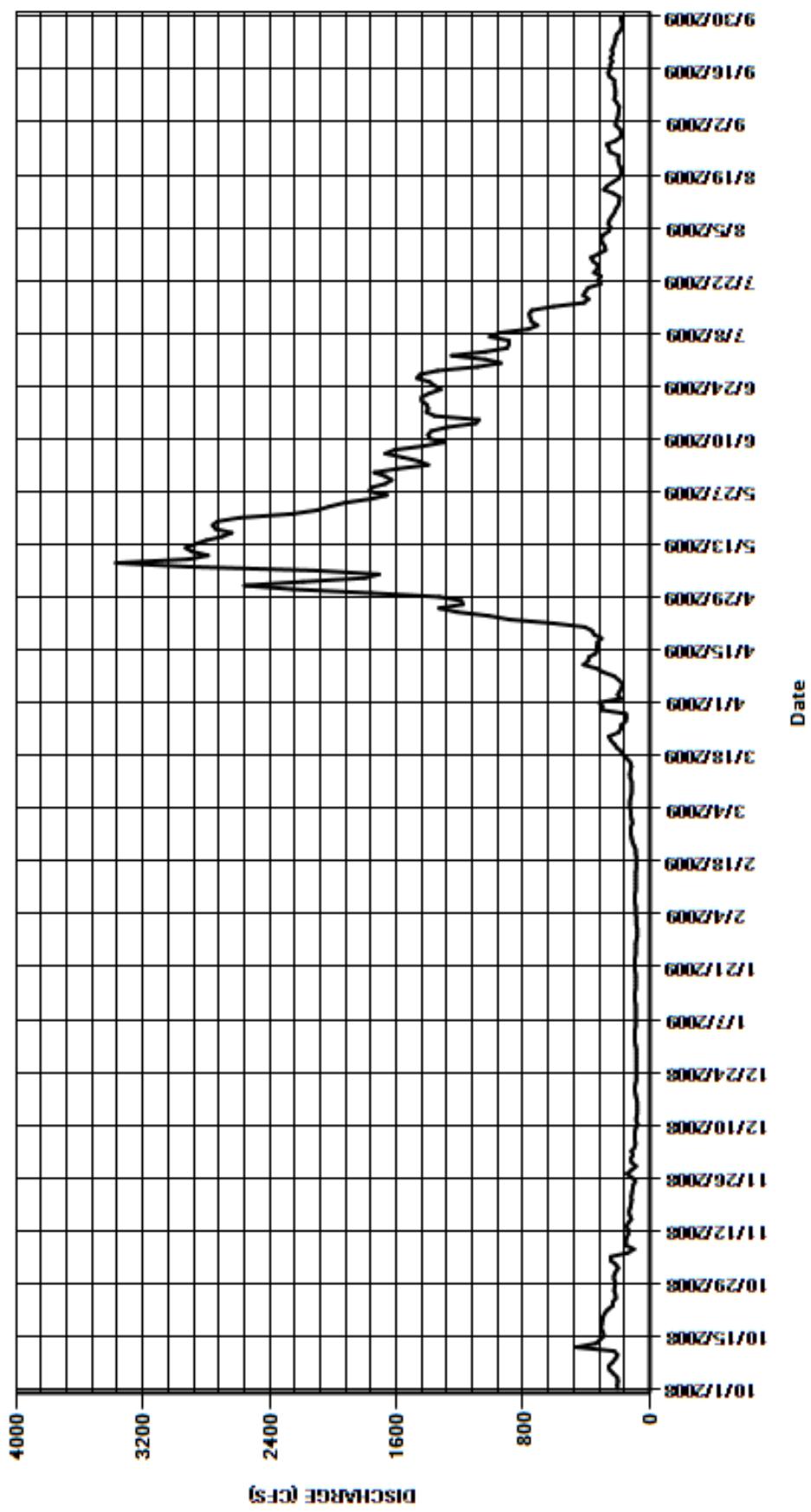
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	203	216	121	95	85	115	318	2250	1740	1040	301	215
2	206	200	106	95	85	120	183	2560	1590	1250	308	214
3	201	216	117	95	85	120	203	2190	1400	1040	294	204
4	206	247	97	95	90	125	190	1800	1460	901	258	199
5	230	248	90	90	90	125	177	1710	1560	890	250	197
6	254	140	95	90	90	125	173	2110	1670	891	262	193
7	261	100	95	90	95	120	198	2910	1610	1010	254	208
8	236	152	95	90	95	115	226	3370	1430	952	239	225
9	216	152	90	90	95	115	292	2910	1300	767	222	218
10	204	148	76	90	90	115	336	2790	1390	710	214	217
11	226	136	85	90	90	115	419	2890	1400	746	197	219
12	463	134	85	95	90	124	390	2930	1380	755	193	226
13	340	148	80	95	90	126	385	2870	1280	762	190	224
14	315	136	80	95	90	122	343	2800	1100	745	229	254
15	290	117	80	90	90	117	334	2700	1080	611	290	264
16	296	127	80	90	85	122	334	2640	1360	416	270	250
17	308	132	85	90	85	142	330	2740	1410	387	233	251
18	304	124	90	90	85	165	304	2760	1400	420	197	237
19	300	119	95	90	85	181	352	2730	1410	406	181	249
20	296	115	95	95	90	208	364	2590	1440	389	179	233
21	285	117	90	95	90	225	410	2260	1440	311	187	241
22	265	113	85	95	100	247	608	2100	1390	327	198	230
23	235	109	85	95	110	259	887	2020	1320	308	200	221
24	234	105	85	90	115	199	1020	1920	1360	353	197	215
25	215	91	85	90	120	184	1220	1760	1390	330	252	212
26	217	113	85	90	120	181	1330	1660	1470	327	257	190
27	226	144	85	90	120	153	1180	1770	1450	359	273	177
28	222	116	85	85	110	147	1190	1760	1340	371	215	174
29	217	87	85	80	---	151	1330	1670	1090	323	183	183
30	226	115	85	80	---	303	1760	1630	941	279	181	183
31	226	---	90	80	---	300	---	1670	---	285	188	---
TOTAL	7923	4217	2782	2810	2665	4966	16786	72470	41601	18661	7092	6523
MEAN	256	141	89.7	90.6	95.2	160	560	2338	1387	602	229	217
AC-FT	15720	8360	5520	5570	5290	9850	33300	143700	82520	37010	14070	12940
MAX	463	248	121	95	120	303	1760	3370	1740	1250	308	264
MIN	201	87	76	80	85	115	173	1630	941	279	179	174
CAL YR	2008	TOTAL	228853	MEAN	625	MAX	3920	MIN	76	AC-FT	453900	
WTR YR	2009	TOTAL	188496	MEAN	516	MAX	3370	MIN	76	AC-FT	373900	

MAX DISCH: 3880 CFS AT 04:15 ON May. 08,2009 GH 4.69 FT. SHIFT 0 FT. (GH CORR.-0.02 FT. APPLIED)

MAX GH: 4.69 FT. AT 04:15 ON May. 08,2009 (GH CORR.-0.02 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08218500 GOOSE CREEK AT WAGONWHEEL GAP
Water Year 2009

Location.-- Lat. 37°45'07", Long. 106°49'46", UTM X 338780.4, Y 4179870.1, in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, T.41 N., R.1 E., Mineral County, Hydrologic Unit 13010001, on left bank 1/4 mile downstream from Pierce Creek, 1 mile upstream from mouth, 1 mile south of Wagon Wheel Gap, and 8 3/4 miles southeast of Creede.

Drainage and Period of Record.-- 90 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 36-inch corrugated metal pipe shelter. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. On Oct. 28, 2008, the existing gage shelter was reset on a new 36 inch concrete well at same location but farther from stream.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 15, 2008 through Mar. 11, 2009 when the oil cylinder was frozen and Oct. 27 and 28, 2008 when gage was being reset. Stage-discharge relation was affected by ice Nov. 6-9, 11, 12, 14-27, Dec. 4-7, 10-14, 2008, Mar. 14-16, 31, and Apr. 2, 6, 2009. There were two instrument corrections made to the shaft encoder. A -0.01 ft correction was prorated back to the previous measurement and a +0.03 ft correction was ran straight back to when the oil cylinder overtopped.

Datum Corrections.-- On Oct. 28, 2008, levels were run to establish the new RP elevation after resetting gage using B.M. 2 as base. Levels were run to the Reference Point (RP) inside the gage on Sep. 3, 2009 using B.M. 2 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Control is a rock and boulder riffle just downstream from the gage. Willows along banks influence high stages. Scouring, filling, and moss cause shift variations. Rating No. 10-1 was created this year. The rating is well defined from 20 to 330 cfs. Sixteen measurements (Nos. 29-44) were made this year ranging in discharge from 12.6 to 326 cfs. They cover the range experienced except for lower daily flows on Jan. 30, 31, Feb. 1, 2008; and the higher daily flows on May 8-22, 2009. The peak flow of 464 cfs occurred at 22:30 on May 11, 2009 at a gage-height of 4.01 feet with a shift of 0 feet. It exceeded high measurement No. 38 (GH=3.70), made May 22, 2009 by 0.31 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied from -0.04 to +0.04 ft. All open water measurements were given full weight except No's. 29, 34, 39, and 41, which were adjusted as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five discharge measurements and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08218500 GOOSE CREEK AT WAGONWHEEL GAP

RATING TABLE--

GOOWAGCO10-1 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

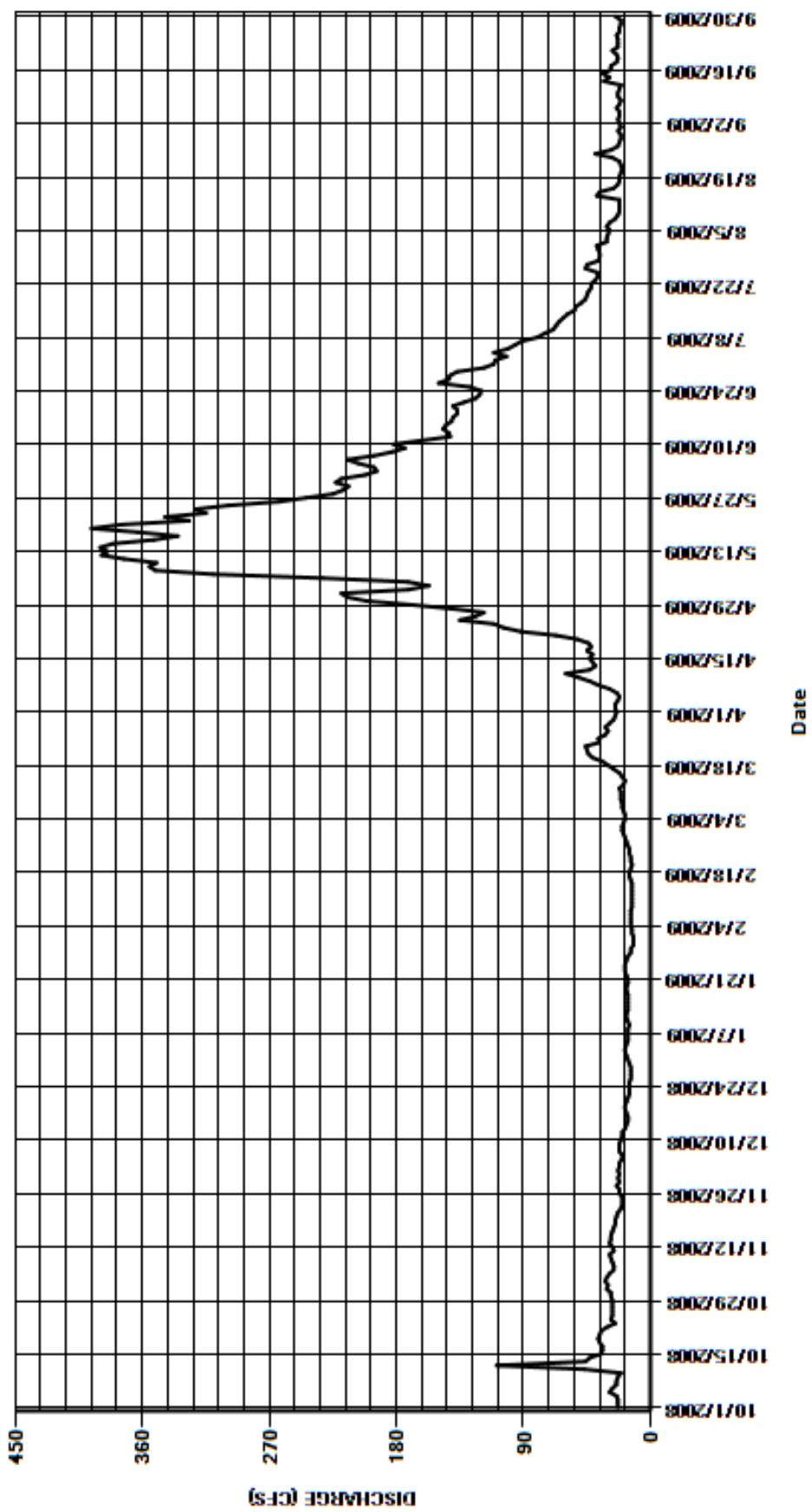
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	31	22	17	12	20	24	215	219	111	38	21
2	23	30	23	18	13	20	25	219	202	110	31	22
3	23	32	22	18	13	19	25	171	194	102	31	23
4	24	31	22	17	14	18	23	157	196	111	30	22
5	29	29	20	16	14	18	22	172	207	101	29	22
6	27	26	20	16	14	19	24	232	215	96	31	24
7	24	26	22	16	14	20	29	310	196	91	29	22
8	24	27	22	16	14	20	37	351	183	80	25	21
9	23	28	22	15	13	21	43	355	174	75	23	23
10	21	29	21	16	13	21	51	350	182	69	22	23
11	47	26	20	17	13	21	60	373	162	67	22	22
12	109	27	20	17	13	22	43	389	142	65	22	21
13	46	29	18	16	13	19	39	385	143	62	22	33
14	43	28	17	16	13	18	41	390	147	59	38	29
15	35	28	16	16	13	20	43	381	145	54	36	34
16	34	27	16	16	14	22	41	352	141	53	26	28
17	34	26	17	16	15	26	45	335	140	49	23	28
18	36	25	18	17	15	30	42	363	137	46	22	24
19	37	25	18	17	14	34	44	396	137	45	22	23
20	36	24	17	16	13	41	52	375	140	44	21	24
21	35	23	16	16	14	44	67	327	132	42	20	27
22	31	21	15	17	14	45	92	344	124	42	21	23
23	25	20	15	18	15	46	104	315	121	39	22	23
24	28	20	15	18	15	36	111	323	120	37	27	23
25	27	20	15	18	16	37	135	299	128	38	39	24
26	27	22	14	17	17	32	124	263	150	46	28	22
27	27	22	14	16	18	30	118	244	143	45	23	22
28	27	24	14	14	19	32	141	225	142	37	22	21
29	27	22	14	14	---	29	169	218	137	36	21	21
30	28	23	15	12	---	26	201	214	118	36	21	25
31	28	---	16	12	---	25	---	223	---	37	23	---
TOTAL	1008	771	556	501	398	831	2015	9266	4717	1925	810	720
MEAN	32.5	25.7	17.9	16.2	14.2	26.8	67.2	299	157	62.1	26.1	24
AC-FT	2000	1530	1100	994	789	1650	4000	18380	9360	3820	1610	1430
MAX	109	32	23	18	19	46	201	396	219	111	39	34
MIN	21	20	14	12	12	18	22	157	118	36	20	21
CAL YR	2008	TOTAL	24883	MEAN	68	MAX	376	MIN	12	AC-FT	49360	
WTR YR	2009	TOTAL	23518	MEAN	64.4	MAX	396	MIN	12	AC-FT	46650	

MAX DISCH: 464 CFS AT 22:30 ON May. 11,2009 GH 4.01 FT. SHIFT 0 FT.

MAX GH: 4.01 FT. AT 22:30 ON May. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08218500 GOOSE CREEK AT WAGONWHEEL GAP
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
Water Year 2009

Location.-- Lat. 37°39'25", Long. 106°38'55", UTM X 354526.8, Y 4169033.0, in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, T.39 N., R.3 E., Rio Grande County, Hydrologic Unit 13010001, on left bank near U.S. Highway 160, 0.1 mile downstream from Church Creek, 0.9 mi southwest of town of South Fork, and 1.5 mi upstream from mouth.

Drainage and Period of Record.-- 216 mi². Station established May 17, 1909 at different site with minimal records. Non-recording to 1910 when water-stage recorder installed. Moved to current site in May 1936

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, air temperature sensor, and tipping-bucket rain gauge in a timber shelter and corrugated metal pipe well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway is located 475 feet upstream. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 16-18, 2008 when the well was frozen and Dec. 19, 2008 through Mar. 11, 2009 when the station was closed for the winter. Stage-discharge relation was affected by ice Nov. 6, 12, 16, 22, 23, 25-28, Dec. 5-15, 2008, and Mar. 12-14, 2009. There were no instrumentation corrections made to the shaft encoder.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 11, 2008 to the Reference Point (RP) inside the gage using BM #7 as base. The RP was within allowable limits, so no correction was made.

Rating.-- A cobble bar approximately 250 feet downstream from the gage is the control. This cobble bar results in a significant flow split at higher gage heights. Shifting is caused by channel scour and fill and also vegetation and debris deposition associated with the cobble bar island. Rating No. 11 developed and used last year was used again this year. The slope of the rating in log-log space indicates that section control governs discharge at most stages. It is fairly well defined from 34 to 2700 cfs. Seventeen measurements (Nos. 227-243) were made this year ranging in discharge from 38.5 to 1,470 cfs. They cover the discharge range experienced except for higher daily flows on May 8-15, 18, 19, 2009. The peak flow of 2120 cfs occurred at 23:15 on May 11, 2009 at a gage-height of 5.83 feet with a shift of -0.02 feet. It exceeded high measurement No. 236 (GH=5.13), made May 8, 2009 by 0.70 feet in stage.

Discharge.-- Shifting control method was used during all open water periods. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied between -0.04 ft. and 0.03 ft. All were given full weight and applied, except Nos. 227-229, 234, 238, 239, and 243 which were adjusted as much as 4% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated based on four measurements, comparison with flows at Rio Grande near Del Norte (RIODELCO), and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK

RATING TABLE--

RIOSFKCO11 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	63	63	49	55	45	50	97	1000	817	282	75	45
2	66	62	50	55	45	55	91	1060	721	289	66	44
3	66	64	47	55	50	55	93	886	680	247	69	42
4	68	67	50	55	50	55	91	811	666	238	72	41
5	92	65	50	50	45	50	89	892	677	225	65	41
6	87	40	55	50	50	50	84	1090	677	222	64	46
7	81	48	50	50	50	50	96	1430	621	211	62	46
8	77	73	50	50	50	50	132	1750	558	176	56	45
9	72	65	45	50	50	50	161	1800	520	156	52	49
10	69	61	45	45	45	50	183	1760	519	145	50	46
11	80	57	40	45	45	50	226	1820	463	137	49	44
12	175	55	40	50	45	55	193	1810	419	130	46	44
13	111	54	45	50	45	60	173	1710	431	119	47	76
14	101	51	45	50	45	65	190	1660	440	113	70	76
15	88	46	45	45	45	71	220	1590	434	106	71	66
16	101	45	45	45	45	79	220	1470	419	101	57	55
17	111	48	50	45	50	96	224	1400	396	93	50	55
18	104	45	60	45	50	120	205	1510	392	89	46	53
19	104	44	65	50	50	145	210	1560	390	85	44	51
20	102	45	65	55	50	178	241	1460	387	86	43	50
21	98	43	60	55	50	207	327	1310	378	84	41	52
22	86	45	55	55	50	234	452	1340	352	82	41	48
23	63	45	50	55	50	238	534	1260	335	77	43	47
24	69	45	50	55	50	196	630	1340	337	74	44	47
25	66	50	50	55	55	170	700	1250	362	72	61	47
26	68	50	50	55	55	149	664	1040	449	80	51	46
27	70	50	50	55	55	136	717	927	430	85	46	44
28	74	55	50	55	50	123	740	821	350	72	43	42
29	71	56	50	50	---	119	773	768	347	69	41	41
30	71	52	50	50	---	112	909	745	292	70	41	44
31	69	---	55	50	---	100	---	806	---	72	45	---
TOTAL	2623	1589	1561	1585	1365	3218	9665	40076	14259	4087	1651	1473
MEAN	84.6	53	50.4	51.1	48.7	104	322	1293	475	132	53.3	49.1
AC-FT	5200	3150	3100	3140	2710	6380	19170	79490	28280	8110	3270	2920
MAX	175	73	65	55	55	238	909	1820	817	289	75	76
MIN	63	40	40	45	45	50	84	745	292	69	41	41

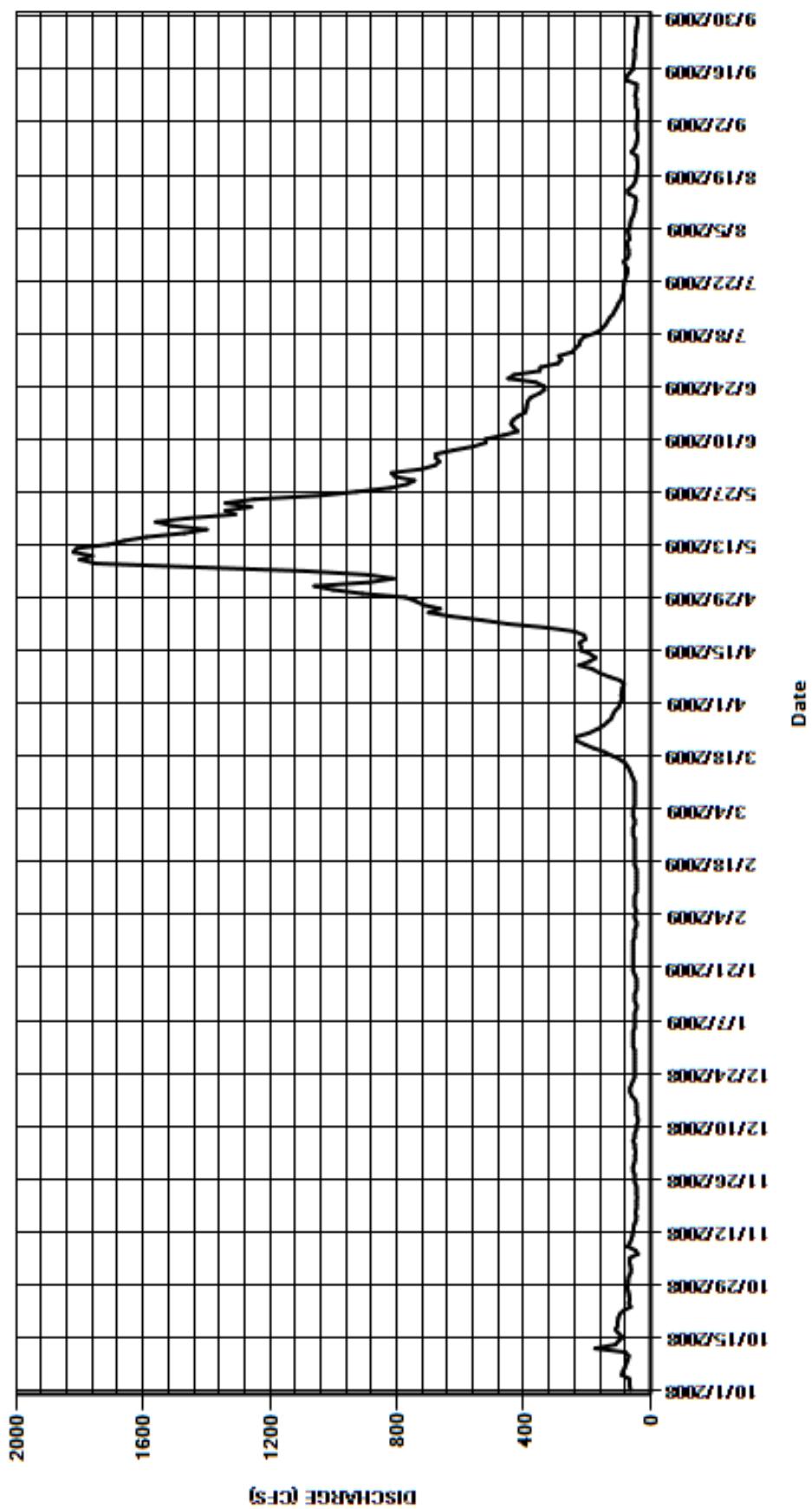
CAL YR	2008	TOTAL	93304	MEAN	255	MAX	1830	MIN	26	AC-FT	185100
WTR YR	2009	TOTAL	83152	MEAN	228	MAX	1820	MIN	40	AC-FT	164900

MAX DISCH: 2120 CFS AT 23:15 ON May. 11,2009 GH 5.83 FT. SHIFT -0.02 FT.

MAX GH: 5.83 FT. AT 23:15 ON May. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08220000 RIO GRANDE RIVER NEAR DEL NORTE
Water Year 2009

Location.-- Lat. 37°41'22", Long. 106°27'38", UTM X 371172.2, Y 4172363.8, in NW¼ Sec. 29, T.40 N., R.5 E., Rio Grande County, Hydrologic Unit 13010001, on right bank 40 ft. downstream from county highway (Twin Mountain) bridge, 5 miles upstream from Pinos Creek, and 6 miles west of Del Norte, CO

Drainage and Period of Record.-- 1,320 mi². Measurements and staff gages with frequent readings begun in June of 1889. Various sites used until present site established in Nov. 1910, with a recorder installed in 1934. All missing periods have been estimated and discharge records are complete from July 1, 1889.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio and phone modem) and a float-operated shaft encoder, air temperature sensor, water temperature sensor, and tipping bucket rain gauge in a 6 ft. by 6 ft. exposed aggregate building with a 4 ft. diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 1500 feet above gaging station. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. The stage-discharge relation was affected by ice Dec. 9, 2008 through Mar. 10, 2009. Two instrumentation corrections were made to the shaft encoder during the year. A -0.01 ft. correction was made on May 11, 2009 and a +0.01 ft. correction was made on Aug. 3, 2009. Both corrections were prorated by time from the previous visit.

Datum Corrections.-- Levels were not run this WY. Levels were last run Jul. 22, 2008 to the Reference Point (RP) inside the gage using BM #6 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Low water control is a wide cobble bar 250 feet below the gage. High water control is the river channel. The channel splits at control section. At gage-heights below approximately 1.00 foot, all water flows in left channel. Rating No. 4, in use since March 15, 2007, was used again this year. It is well defined from 53 to 9000 cfs. This rating was extended to 12,500 cfs using data acquired from a USGS cooperative rating curve extension project completed in 2003. Twenty-six measurements (Nos. 111-136) were made this year, ranging in discharge from 88.0 to 5200 cfs. They cover the discharge range experienced except for the higher daily flow on May 8, 2009. The peak flow of 6040 cfs occurred at 08:00 on May 8, 2009 at a gage-height of 4.87 feet (GH corr. -0.01 ft. applied) with a shift of -0.08 feet. It exceeded high measurement No. 126 (GH = 4.51), made May 11, 2009 by 0.36 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Two variable shift curves were used to distribute shifts according to stage. RIODELVS0901 was used from Mar. 16 to May 1, 2009. RIODELVS0902 was used from May 1 to Sep. 1, 2009. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Open water measurements show shifts varied between -0.09 and +0.03 ft. All measurements were given full weight except Nos. 113, 114, 122, 125, 127-129, 132, 133, and 135, which were adjusted as much as 5 percent to smooth shift distribution. The two highest measurements, Nos. 126 & 127, resulted in shifts of -0.08 and -0.09 feet. They both varied from the rating by less than 5%. It was noted that there was a large tree root-ball lodged under the bridge near LEW that remained throughout the high water period. It was assumed that this root-ball may have changed the flow regime through the gage-pool and influenced the rating during the highest flows. Therefore, shift curve RIODELVS0902 incorporated these shifts and was left open at the upper end. The other measurements during the high water period resulted in shifts from -0.01 to +0.01 feet and were adjusted to the rating.

Special Computations.-- Discharge for periods of ice-affected record was based on six measurements, partial day records, weather records, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good except for periods of ice affected record, which should be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08220000 RIO GRANDE RIVER NEAR DEL NORTE

RATING TABLE--

RIODELCO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

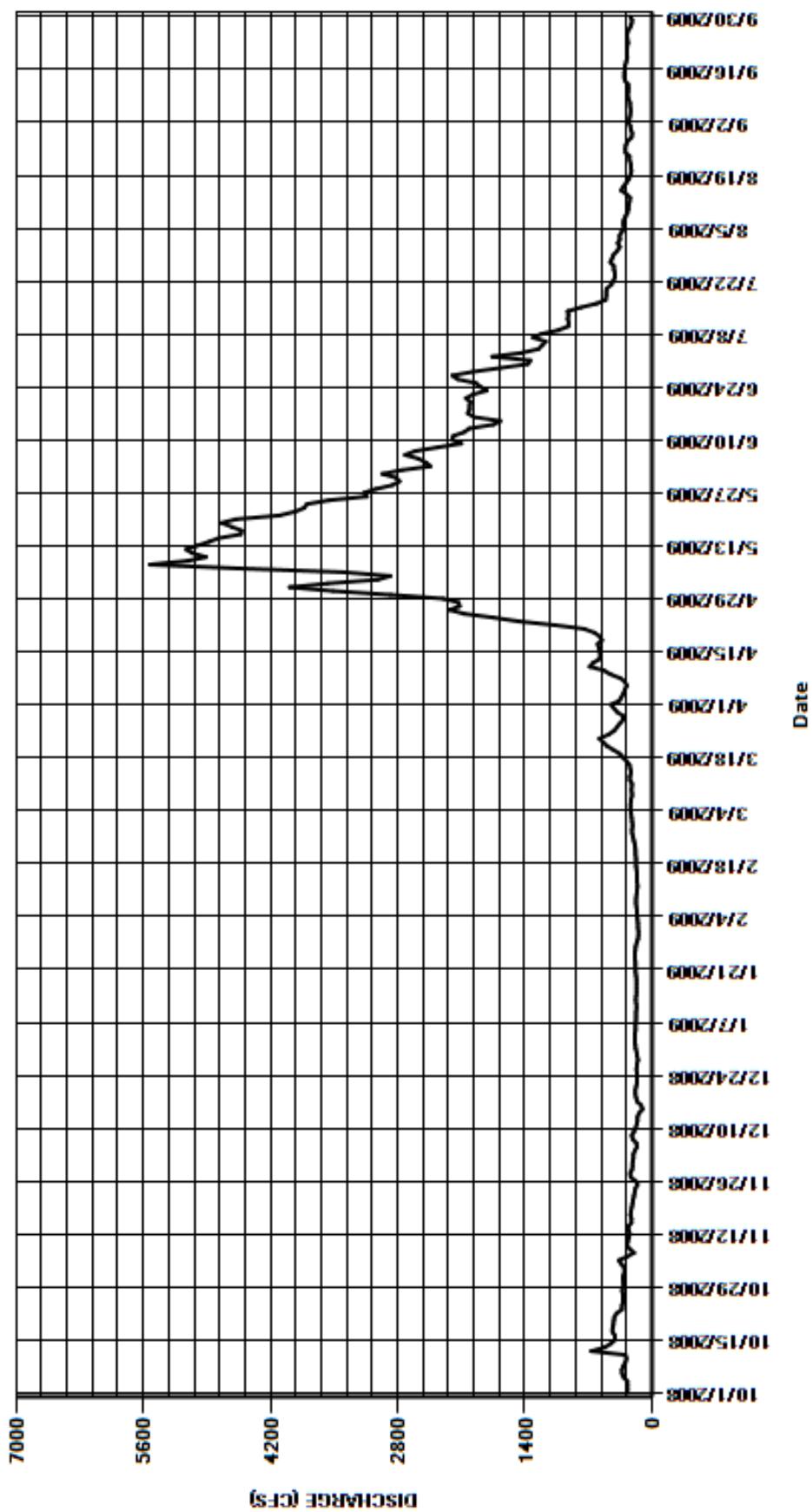
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	271	317	214	185	155	220	451	3510	2970	1340	377	240
2	269	302	206	190	155	225	359	3990	2750	1760	354	262
3	269	305	207	190	160	230	336	3570	2440	1430	358	248
4	271	336	189	190	165	235	313	3020	2490	1250	333	240
5	311	365	167	180	165	235	298	2880	2570	1210	310	235
6	329	277	172	180	170	235	277	3400	2720	1170	317	241
7	334	198	211	180	175	230	298	4560	2610	1310	313	242
8	316	246	223	175	175	220	352	5530	2360	1220	294	256
9	294	278	200	175	175	225	460	5110	2100	1030	272	269
10	282	267	180	175	170	225	531	4910	2200	921	259	263
11	293	256	170	170	165	221	687	5060	2190	919	257	260
12	670	246	160	175	160	243	649	5130	2070	928	249	263
13	520	257	160	180	165	244	580	5010	2010	921	242	299
14	452	259	140	175	165	230	567	4880	1750	928	285	307
15	410	226	105	170	165	240	578	4770	1670	783	340	306
16	406	226	120	170	170	248	585	4530	1960	613	314	297
17	435	238	165	170	175	281	599	4520	2030	511	283	296
18	435	232	175	170	175	319	551	4630	2010	505	253	285
19	426	224	185	175	175	356	575	4740	2010	505	238	273
20	422	215	185	180	180	425	633	4580	2000	499	228	279
21	415	210	175	180	180	494	748	4100	2050	448	231	275
22	391	199	165	185	185	538	1070	3930	1970	427	236	274
23	332	192	165	185	190	579	1470	3830	1820	407	248	264
24	331	184	165	190	200	482	1750	3800	1890	409	248	273
25	318	159	170	190	210	421	2070	3560	1940	419	294	275
26	318	181	170	185	220	385	2230	3140	2140	422	296	268
27	319	235	165	180	220	354	2120	3170	2200	460	287	243
28	331	242	155	170	215	318	2130	3040	1970	439	269	226
29	317	221	165	155	---	320	2300	2860	1670	423	225	220
30	315	213	170	150	---	384	2880	2780	1370	382	218	242
31	323	---	180	150	---	420	---	2820	---	355	233	---
TOTAL	11125	7306	5379	5475	4980	9782	28447	125360	63930	24344	8661	7921
MEAN	359	244	174	177	178	316	948	4044	2131	785	279	264
AC-FT	22070	14490	10670	10860	9880	19400	56420	248700	126800	48290	17180	15710
MAX	670	365	223	190	220	579	2880	5530	2970	1760	377	307
MIN	269	159	105	150	155	220	277	2780	1370	355	218	220
CAL YR	2008	TOTAL	357990	MEAN	978	MAX	6090	MIN	105	AC-FT	710100	
WTR YR	2009	TOTAL	302710	MEAN	829	MAX	5530	MIN	105	AC-FT	600400	

MAX DISCH: 6040 CFS AT 08:00 ON May. 08,2009 GH 4.87 FT. SHIFT -0.08 FT. (GH CORR. -0.01 FT. APPLIED)

MAX GH: 4.87 FT. AT 08:00 ON May. 08,2009 (GH CORR. -0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08220000 RIO GRANDE RIVER NEAR DEL NORTE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08220500 PINOS CREEK NEAR DEL NORTE
Water Year 2009

Location.-- Lat. 37 degrees 35 minutes 30 seconds, Long. 106 degrees 26 minutes 51 seconds, UTM X 371984.3, Y 4161499.8, in the SW 1/4 SE 1/4 sec. 29 T. 39, R5E, N.M.P.M. in Rio Grande County, on left bank approximately 200 ft. downstream from Bennett Creek and 8 miles southwest of Del Norte.

Drainage and Period of Record.-- 53 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 3 ft. by 3 ft. timber shelter and concrete well at a 12-foot rectangular concrete box control with a steel triangular ramp on each side of the concrete box at the discharge end. The primary reference gage is a drop tape from reference point on shelf. A supplemental outside staff gage is located in the concrete box. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 4-17, 2008 when the well was frozen; Dec. 18, 2008 to Mar. 11, 2009 when the station was closed for the winter. Stage-discharge relation was affected by ice Oct. 21-23, Nov. 4-30, Dec. 1-3, 2008 and March 12-15, 28, 29, 31, and Apr. 1, 2, 5-7, 2009. There were two instrumentation corrections made to the shaft encoder of -0.01 and +0.01 feet. These corrections were prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on September 3, 2009 using B.M. No. 3 as base. The RP elevation was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- The control is a 12 ft. wide, 12 ft. long, 5 ft. high concrete box/flume with a steel triangular ramp on each side of the concrete box at the discharge end. Minor shifting occurs mainly due to spalling of the concrete and movement of streambed materials through the box. Rocks, trees, and approach angle in the streambed above the gage also cause some shifting. Rating No. 15 was used for the entire water year. Eighteen measurements (Nos. 120-137) were made this year ranging in discharge from 7.06 to 199 cfs. They cover the discharge range experienced except for the lower daily flows on Nov. 21-30, Dec. 1-17, 19-31, 2008, Jan. 1-23, 27-31, 2009 and higher daily flows on May 8-12, 14, 15, 2009. The peak flow of 270 cfs occurred at 22:15 on May 11, 2009 at a gage-height of 2.65 feet with a shift of +0.06 feet. It exceeded high measurement No. 128 (GH=2.33), made May 8, 2009 by 0.32 feet in stage.

Discharge.-- Shifting control method was used during all open water periods. Two variable shift curves were used to distribute shifts according to gage-height. Shift curve (PINDELCOVS0901) was used from Mar. 11 to May 8, 2009, and shift curve (PINDELCOVS0902) was used from May 8 to September 22, 2009. Measurement Nos. 129, 130 were both made at poor measurement locations, (bad velocity profiles) showing shifts of +0.20, and +0.23 respectively, and were not used for record development. All other open water measurements show shifts varied from -0.01 to +0.06 feet. These measurements were given full weight except for Nos. 131, 133-136 which were adjusted by as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five measurements, comparison with nearby stations, and weather records. A hydrograph was used.

Remarks.-- High approach velocity in the gage pool results in standing waves in the flume that create instability above gage heights of approximately 2.30'. For this reason, record for the period May 6-16, 2009 including the peak flow should be considered fair. All other record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08220500 PINOS CREEK NEAR DEL NORTE

RATING TABLE--

PINDELCO15 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.9	8.6	7	5.5	7.5	9	13	131	119	48	13	10
2	9	8.6	7	6	8	10	14	139	110	46	12	8.8
3	8.8	8.8	7	6.5	8	11	11	132	111	43	12	7.9
4	8.8	8.6	6.5	6	8	12	11	135	101	37	12	9
5	11	7.4	7	5.5	8	12	11	147	102	38	13	13
6	10	7.2	7	5.5	8.5	11	13	165	103	37	14	11
7	9.2	8	7	5.5	8.5	11	13	190	90	32	11	11
8	9	8	6.5	5.5	8.5	11	18	219	84	28	10	10
9	8.7	8	6.5	5.5	8	10	23	214	82	27	9.8	10
10	8.6	7.9	6	5.5	8	10	23	216	86	26	9.5	11
11	11	8.4	6	5.5	8	10	29	218	79	27	9.3	8.3
12	17	8.5	6	6	8	9.5	22	220	70	25	9.1	7.7
13	10	8	6	6	8	8.6	19	199	68	24	9.4	15
14	11	8	6	6	8	10	19	209	69	23	15	12
15	10	8	5.5	6	8	9.6	20	204	64	21	12	12
16	11	8	6	6	8	10	21	194	61	20	11	10
17	10	8	6.5	6	8.5	11	21	178	60	19	11	13
18	10	8	7.5	6	8.5	12	20	179	62	17	10	11
19	10	8	7	6	8	15	20	180	60	17	10	9.7
20	9.8	7.5	6	6.5	8	17	23	160	60	17	9.8	10
21	9.5	7	6	6	8	18	31	149	59	17	9.8	10
22	7.4	6.5	6	6.5	8	19	46	153	55	17	10	9.7
23	8	6.5	6	7	9	21	60	149	54	16	11	9.8
24	9.5	6.5	6	7.5	9.5	17	75	146	57	16	12	9.9
25	8.9	6	6	8	9.5	15	80	134	58	16	13	10
26	9.3	6	5.5	8	9.5	15	75	136	64	18	11	9.5
27	8.7	6.5	5	7	9	13	76	129	58	17	9.9	8.6
28	8.7	6.5	5.5	6	9	13	86	138	55	16	9.3	8.5
29	8.2	6.5	5.5	6.5	---	13	101	131	58	16	9.1	8.2
30	8.6	7	5.5	6.5	---	12	121	123	50	15	10	10
31	8.4	---	5.5	7	---	13	---	128	---	13	11	---
TOTAL	297.0	226.5	192.5	193.0	233.5	388.7	1115	5145	2209	749	339.0	304.6
MEAN	9.58	7.55	6.21	6.23	8.34	12.5	37.2	166	73.6	24.2	10.9	10.2
AC-FT	589	449	382	383	463	771	2210	10210	4380	1490	672	604
MAX	17	8.8	7.5	8	9.5	21	121	220	119	48	15	15
MIN	7.4	6	5	5.5	7.5	8.6	11	123	50	13	9.1	7.7

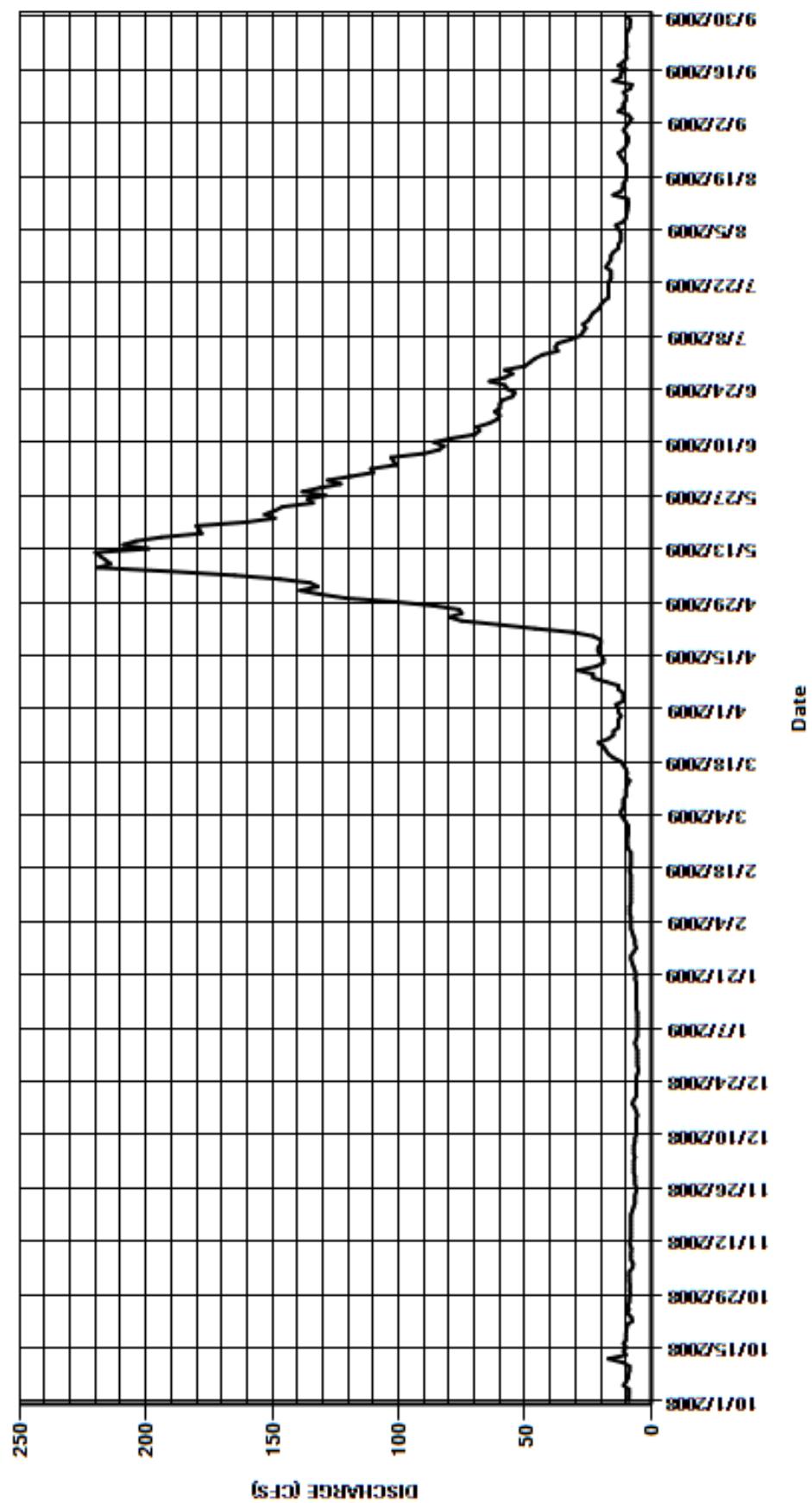
CAL YR	2008	TOTAL	12702.3	MEAN	34.7	MAX	254	MIN	2.5	AC-FT	25200
WTR YR	2009	TOTAL	11392.8	MEAN	31.2	MAX	220	MIN	5	AC-FT	22600

MAX DISCH: 270 CFS AT 22:15 ON May. 11,2009 GH 2.65 FT. SHIFT 0.06 FT.

MAX GH: 2.65 FT. AT 22:15 ON May. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08220500 PINOS CREEK NEAR DEL NORTE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08221500 RIO GRANDE RIVER AT MONTE VISTA
Water Year 2009

Location.-- Lat. 37°36'34", Long. 106°08'54", UTM X 398593.7, Y 4163104.3, in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, T.39 N., R.8 E., Rio Grande County, Hydrographic Unit 13010002, on left bank 40 ft. downstream from bridge on U.S. Highway 285, 2.0 mi. north of Monte Vista, and 12 mi. downstream from San Francisco Creek.

Drainage and Period of Record.-- 1,590 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping-bucket rain gauge in a 72 inch corrugated metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Feb. 7-25, 2009 when DCP malfunctioned and recorder clock stopped. Stage-discharge relation was affected by ice Dec. 10, 2008 through Feb. 6, 2009 and Feb. 26 through Mar. 8, 2009. Six different flush corrections were made ranging from a -0.01 to -0.05 ft, which were prorated back to the previous inflection point.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 22, 2008 to the Reference Point (RP) inside the gage using BM #3 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control at most stages is small cobble riffle approximately 500 ft. below gage. Low water control is a gravel and small cobble riffle 25 feet below the gage. There are two channels at gage during lower stages due to sedimentation behind bridge pier above gage. Rating No. 21 was developed and put into use starting Oct. 1, 2008. It is well defined from 16 to 5500 cfs. Nineteen measurements (Nos. 234-252) were made this year, ranging in discharge from 16.5 to 1,860 cfs. They cover the discharge range experienced during this water year except for the lower daily flows on Nov. 20 – Dec. 9, 2008 and the higher daily flows on May 7-8, 2009. The peak flow of 2730 cfs occurred at 10:15 on May 7, 2009 at a gage-height of 6.12 ft. with a shift of 0.00 feet. It exceeded high measurement No. 243 (GH = 5.40), made May 13, 2009, by 0.72 feet in stage.

Discharge.-- Shifting-control method was used for all open water periods. Shifts were applied as defined by measurements and distributed by time. The measurements show shifts varied between -0.08 and +0.07 ft. All measurements were given full weight except Nos. 235, 237, 239, 240, 242, 244-246, 249, and 251, which were adjusted as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was based on comparison with nearby gages using a river accounting sheet.

Remarks.-- Record is good except for periods of no gage-height and ice-affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08221500 RIO GRANDE RIVER AT MONTE VISTA

RATING TABLE--

RIOMONCO21-1 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

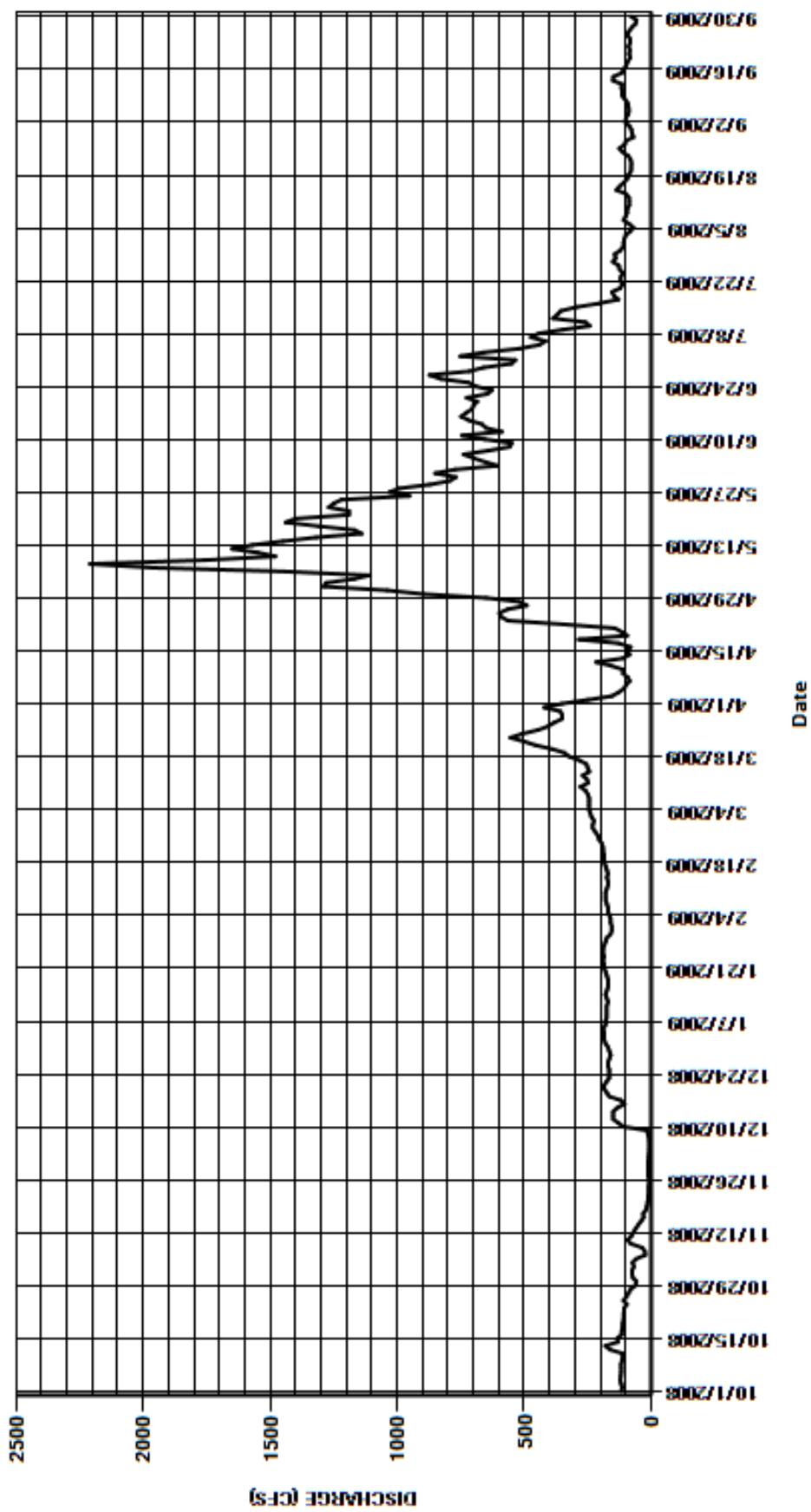
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	118	76	12	180	155	225	352	1040	851	535	109	87
2	115	75	10	185	160	235	250	1290	772	752	106	102
3	119	68	8.7	185	160	240	155	1280	606	659	101	100
4	122	74	8.1	185	165	245	128	1170	654	519	84	91
5	120	60	7.5	190	170	245	107	1110	699	441	70	88
6	119	24	7.6	180	170	245	99	1440	739	416	87	90
7	118	25	9.4	180	175	245	85	1960	641	474	109	93
8	119	36	13	175	180	250	93	2210	557	443	101	103
9	116	80	14	175	180	259	111	1760	549	349	95	115
10	112	93	110	175	180	279	109	1480	656	242	94	114
11	114	79	130	175	175	249	156	1550	745	259	87	117
12	163	70	150	170	170	253	217	1650	588	387	87	115
13	181	62	150	175	170	270	112	1570	651	370	88	151
14	131	51	150	180	175	244	85	1450	666	356	100	149
15	133	40	134	175	170	250	100	1320	717	294	137	116
16	116	30	105	170	175	255	81	1140	749	203	124	109
17	116	32	120	170	180	283	129	1170	729	129	107	98
18	112	21	165	170	185	323	285	1310	705	147	94	93
19	112	17	175	175	185	342	95	1440	700	155	89	83
20	109	14	185	180	185	390	116	1400	685	122	80	87
21	108	12	185	185	190	455	144	1190	727	114	79	84
22	108	11	175	185	190	501	341	1190	646	121	78	89
23	106	9.9	165	190	195	554	564	1270	627	120	81	83
24	96	10	165	185	205	509	592	1250	691	111	90	83
25	110	8.9	165	190	210	447	598	1220	719	125	112	95
26	97	8.8	170	190	220	406	565	952	830	128	126	88
27	89	12	170	185	230	382	490	1030	873	151	105	77
28	81	12	165	180	230	351	519	991	716	140	100	62
29	62	11	160	175	---	351	650	872	660	144	70	58
30	58	11	165	160	---	358	896	793	550	122	76	81
31	72	---	170	155	---	421	---	769	---	109	78	---
TOTAL	3452	1133.6	3519.3	5530	5135	10062	8224	40267	20698	8637	2944	2901
MEAN	111	37.8	114	178	183	325	274	1299	690	279	95	96.7
AC-FT	6850	2250	6980	10970	10190	19960	16310	79870	41050	17130	5840	5750
MAX	181	93	185	190	230	554	896	2210	873	752	137	151
MIN	58	8.8	7.5	155	155	225	81	769	549	109	70	58
CAL YR	2008	TOTAL	158748.9	MEAN	434	MAX	2600	MIN	7.5	AC-FT	314900	
WTR YR	2009	TOTAL	112502.9	MEAN	308	MAX	2210	MIN	7.5	AC-FT	223100	

MAX DISCH: 2730 CFS AT 10:15 ON May. 07,2009 GH 6.12 FT. SHIFT 0 FT.

MAX GH: 6.12 FT. AT 10:15 ON May. 07,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08221500 RIO GRANDE RIVER AT MONTE VISTA
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE
Water Year 2009

Location.-- UTM X 406626, Y 4158964, in NW ¼ NW ¼ NW ¼ section 1, T38N, R8E, NMPM, Rio Grande County, on left bank approximately 1 mile above bridge on county line road.

Drainage and Period of Record.-- 1,640 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 42-inch diameter corrugated metal well and shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 18, 2008 through Mar. 2, 2009 when the station was closed for winter. Stage-discharge relation was affected by ice Dec. 10-17, 2008 and Mar. 3-8, 2009. There were three instrument corrections made to the shaft encoder. A correction of +0.01 ft. was made on Nov. 19, 2008 and was prorated by time from previous visit. The two other corrections of +0.08 ft and +0.04 ft. resulted from Isopar leaking out of the bottom of the oil cylinder at low gage-heights. These corrections were prorated back from the point the leak occurred, using recorder chart for comparison.

Datum Corrections.-- Levels were not run this year. Levels were last run Jul. 22, 2008 to the Reference Point (RP) inside the gage using BM #4 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Rating RIOLINCO09 was used again this year. Fourteen measurements (Nos. 326-339) were made this year ranging in discharge from 2.79 to 784 cfs. These measurements cover the discharge range experienced except for the lower daily flows of Nov. 19, 22, 23, Dec. 2-9, 2008 and higher daily flows of May 7, 8, 2009. The maximum discharge of 1270 cfs occurred at 14:00 on May 7, 2009 at a gage-height of 5.67 ft. with a shift of -0.06 ft. It exceeded high measurement No. 332 (GH = 4.88) by 0.79 feet in stage.

Discharge.-- Shifting control method was used during all open water periods. A variable shift curve was used from Oct. 1 to Dec. 18, 2008 to distribute shifts according to stage. During other periods, shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied from -0.27 ft to 0.00 ft. All open water measurements were given full weight and applied as defined except for Nos. 333, 335, and 337 which were adjusted by as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated by comparison with nearby stations using a river accounting sheet.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE

RATING TABLE--

RIOLINCO09 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	75	72	3.3	180	165	245	377	199	244	135	54	47
2	74	76	2.2	185	170	245	260	357	153	253	54	57
3	78	74	2.2	185	170	255	166	400	101	225	50	61
4	81	78	2.2	185	175	255	136	479	140	151	43	54
5	80	74	2.1	190	180	260	106	477	182	103	32	51
6	76	17	2	180	180	255	99	601	221	92	43	53
7	72	3.1	2	175	185	250	80	873	147	99	67	56
8	74	2.9	2.1	175	185	255	79	903	72	98	62	60
9	59	17	2.2	175	185	263	99	663	136	71	56	72
10	50	44	40	175	190	281	100	448	188	22	54	73
11	51	32	100	175	185	261	96	427	240	18	49	74
12	90	23	140	175	180	257	190	565	82	99	41	73
13	148	18	155	175	180	273	88	586	116	68	39	107
14	100	11	155	180	185	258	50	501	127	65	51	121
15	107	5.9	130	175	180	258	94	398	192	84	89	87
16	82	3.1	110	175	185	265	74	258	236	149	84	73
17	70	3.7	125	175	190	285	79	227	225	73	63	62
18	60	4.3	170	175	195	329	316	287	195	90	53	57
19	55	2.6	175	180	200	355	90	354	192	106	48	51
20	51	2.9	185	185	200	398	48	333	179	75	42	54
21	61	4	185	195	205	465	8.3	291	235	54	37	55
22	68	2.6	175	190	205	513	51	351	142	64	36	56
23	69	2.3	165	190	210	562	130	464	146	62	41	56
24	58	3.5	165	185	220	540	130	422	202	52	45	58
25	84	3.1	170	190	230	475	145	492	242	63	63	63
26	68	3.3	170	190	240	431	124	300	357	62	88	59
27	61	3.5	170	190	245	407	72	380	357	87	70	57
28	59	3.8	170	185	245	381	61	361	225	87	63	52
29	49	3.9	160	175	---	370	110	255	196	87	43	41
30	42	4	170	170	---	367	171	220	118	78	41	53
31	59	---	175	165	---	442	---	239	---	63	41	---
TOTAL	2211	598.5	3380.3	5600	5465	10456	3629.3	13111	5588	2835	1642	1893
MEAN	71.3	19.9	109	181	195	337	121	423	186	91.5	53	63.1
AC-FT	4390	1190	6700	11110	10840	20740	7200	26010	11080	5620	3260	3750
MAX	148	78	185	195	245	562	377	903	357	253	89	121
MIN	42	2.3	2	165	165	245	8.3	199	72	18	32	41

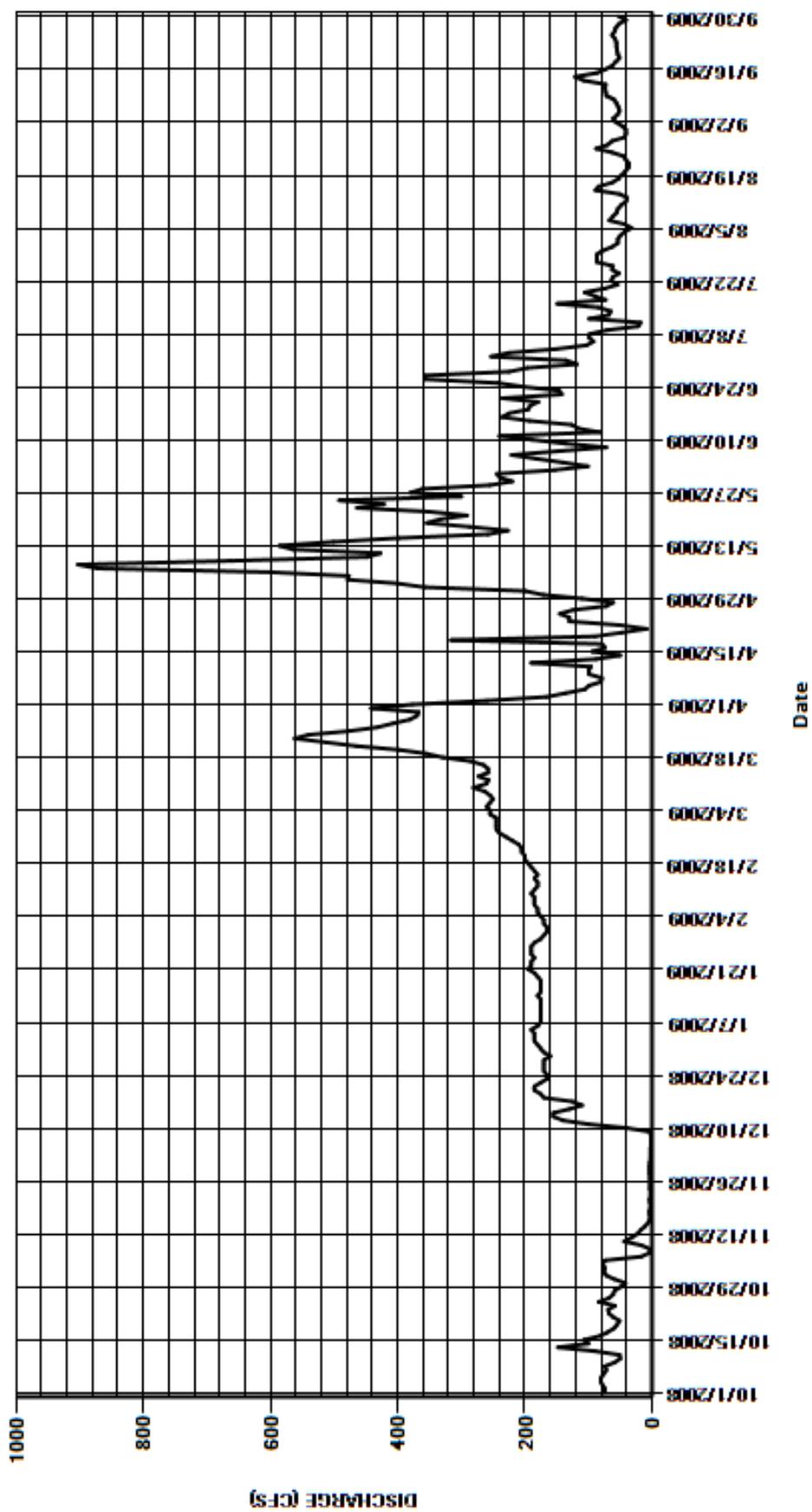
CAL YR	2008	TOTAL	100417.8	MEAN	274	MAX	1740	MIN	2	AC-FT	199200
WTR YR	2009	TOTAL	56409.1	MEAN	155	MAX	903	MIN	2	AC-FT	111900

MAX DISCH: 1270 CFS AT 14:00 ON May.07,2009 GH 5.67 FT. SHIFT -0.06 FT.

MAX GH: 5.67 FT. AT 14:00 ON May.07,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08223000 RIO GRANDE RIVER AT ALAMOSA
Water Year 2009

Location.-- Lat. 37°28'51", Long. 105°52'39", UTM X 422194.7, Y 4148640.6, in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 4, T. 37 N., R. 10 E., Alamosa County, on left bank 0.3 mile northwest of Adams State College and 9 miles upstream from Alamosa Creek.

Drainage and Period of Record.-- 1,710 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), air temperature sensor, and a float-operated shaft encoder in a 4 ft. by 6 ft. exposed aggregate building with a 4 ft. diameter concrete well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. The stage-discharge relation was affected by ice Dec. 10, 2008 through Feb. 22, 2009. There were three instrument corrections made to the shaft encoder ranging from -0.02 to +0.01 feet. The -0.02 ft correction was ran straight back to arbitrary point before coming out of ice affected period. The others were prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 17, 2009 using B.M. No. 7 as base. The RP elevation was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- The control is a sand streambed and channel. The sand movement, change in vegetation, and changes to downstream diversion structure (Westside Diversion) cause numerous shift changes. Rating No. 22D was used this water year. The upper end of curve (above 1500 cfs) was created by the USGS using indirect measurement methods as part of a cooperative rating curve extension project. Fourteen measurements (Nos. 302-315) were made this year ranging in discharge from 29.5 to 351 cfs. They cover the discharge range experienced except for lower daily flows on Aug. 4-7, 12, 18, 2009 and higher daily flows on Mar. 5, 20-31, Apr. 1, May 7-11, 13-15, 2009. The peak flow of 872 cfs occurred at 12:45 on May 9, 2009 at a gage-height of 5.13 ft. with a shift of -0.14 ft. It exceeded high measurement No. 305(GH=3.40), made Mar. 4, 2009, by 1.73 ft. in stage.

Discharge.-- Shifting control method was used for all open water periods. A variable shift curve was used from May 6 to Sep. 22, 2009 to distribute shifts according to stage. Measurement No. 278 from WY2007 was used to define the upper end of the shift curve. This shift curve provides a peak discharge that compares very closely to the same peak at downstream gage 'Rio Grande above Mouth of Trinchera Creek'. During the rest of the year, shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied from -0.46 ft to -0.06 ft. All measurements were given full weight and applied except Nos. 306, 307 and 313-315 which were adjusted by as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice-affected record was estimated by comparison with nearby stations using a river accounting sheet.

Remarks.-- Record is good except for periods of ice-affected record, which are poor; and periods of daily discharge greater than 420 cfs, including the peak discharge, should be considered fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08223000 RIO GRANDE RIVER AT ALAMOSA

RATING TABLE--

RIOALACO22D USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

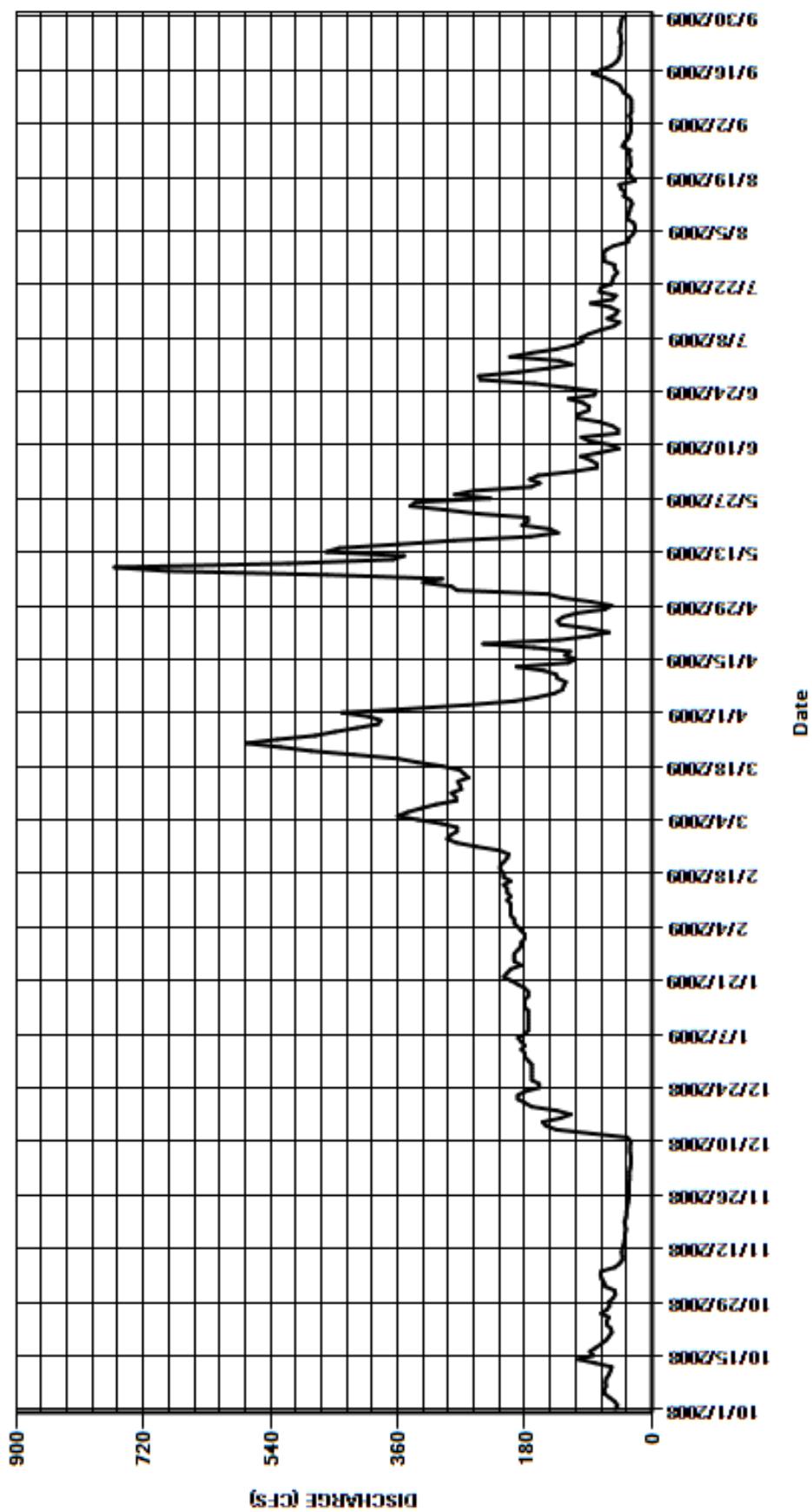
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	53	32	180	180	276	439	127	173	113	54	30
2	49	66	32	180	180	276	345	147	161	131	34	30
3	53	68	31	185	185	298	261	276	112	201	33	30
4	60	71	30	180	190	331	195	284	78	171	27	32
5	67	73	30	185	195	360	163	324	78	135	24	29
6	68	72	30	190	195	346	139	297	87	112	24	29
7	65	53	31	180	200	327	127	460	101	99	26	29
8	66	46	31	175	200	306	125	685	73	101	35	29
9	65	42	31	175	200	277	122	761	47	89	34	32
10	61	42	30	175	200	278	134	515	59	73	32	40
11	59	43	35	175	205	284	136	367	89	54	31	43
12	57	42	85	175	200	270	153	351	100	46	28	46
13	80	40	135	175	205	272	192	461	48	63	31	56
14	104	39	150	180	205	275	119	443	48	52	40	68
15	83	38	155	180	210	260	108	358	57	48	38	84
16	88	38	130	180	200	266	123	280	75	59	44	72
17	80	37	115	175	210	272	116	172	106	87	46	58
18	72	38	135	175	210	297	167	133	104	56	24	51
19	65	39	170	180	215	332	239	145	90	51	29	47
20	61	37	180	190	215	360	132	184	89	74	33	45
21	57	36	190	200	210	422	89	176	98	73	33	45
22	58	36	190	210	205	483	61	176	118	58	30	45
23	64	35	180	205	203	526	89	246	82	56	31	43
24	64	34	160	200	216	575	130	293	79	54	31	44
25	61	33	160	185	249	530	134	342	122	49	33	44
26	72	33	170	195	277	477	126	335	166	53	31	46
27	64	33	170	195	290	449	107	229	243	53	42	45
28	60	33	170	195	285	418	67	279	245	68	39	44
29	61	33	170	190	---	388	57	252	189	68	34	43
30	55	32	170	185	---	384	87	171	147	69	32	41
31	52	---	175	185	---	401	---	159	---	65	30	---
TOTAL	2023	1315	3503	5735	5935	11016	4482	9428	3264	2481	1033	1320
MEAN	65.3	43.8	113	185	212	355	149	304	109	80	33.3	44
AC-FT	4010	2610	6950	11380	11770	21850	8890	18700	6470	4920	2050	2620
MAX	104	73	190	210	290	575	439	761	245	201	54	84
MIN	49	32	30	175	180	260	57	127	47	46	24	29
CAL YR	2008	TOTAL	91729	MEAN	251	MAX	1300	MIN	30	AC-FT	181900	
WTR YR	2009	TOTAL	51535	MEAN	141	MAX	761	MIN	24	AC-FT	102200	

MAX DISCH: 872 CFS AT 12:45 ON May. 09,2009 GH 5.13 FT. SHIFT -0.14 FT.

MAX GH: 5.13 FT. AT 12:45 ON May. 09,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**08223000 RIO GRANDE RIVER AT ALAMOSA
WY2009 HYDROGRAPH**



RIO GRANDE RIVER BASIN
372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
Water Year 2009

Location.-- Lat. 37°28'33", Long. 105°45'58", UTM X 432260.8, Y 4147935.8, SW $\frac{1}{4}$ SW $\frac{1}{4}$, sec. 3, T.37 N., R.11 E., Alamosa County, Hydrologic Unit 13010002, 400 ft north of State Highway 160, 5.5 mi east of Alamosa, Co. on right bank of Closed Basin Project Canal.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and two float-operated shaft encoders on wells Ha and Hb in 8 ft. x 10 ft. steel plated building with concrete stilling wells. The Bureau of Reclamation owns and operates an independent electronic data acquisition system using pressure transducers, a water quality monitor, and temperature sensor. The primary reference gage is a drop tape from reference point on shelf. There is a supplemental outside staff gage in the flume. This staff gage was replaced on Aug. 7, 2009.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. The stage-discharge relation was not affected by backwater (submerged) during this water year.

Datum Corrections.-- Levels were not run this WY. Levels were last run Aug. 7, 2008 to the Ha well and Hb well Reference Points (RP) inside the gage using R.M. #1 as base. Both RPs were within allowable limits, so no correction was made.

Rating.-- The control structure is a 12 ft. concrete Parshall flume. A standard rating for a 12 ft. Parshall flume has been in use since Sep. 23, 1987. Twenty-six measurements (Nos. 557-582) were made this year, ranging in discharge from 12.5 to 34.4 cfs. They cover the discharge range experienced except for lower daily flow Oct. 27-29, 2008, and Aug. 5-11, 2009. The peak flow of 36 cfs occurred at 16:00 on May 31, 2009 at a gage-height of 0.80 feet (GH corr. -0.08 ft. applied) with a shift of +0.05 feet. It exceeded high measurement No. 574 (GH=0.78), made Jun. 1, 2009, by 0.02 feet in stage.

Discharge.-- Shifting control method was used for the entire year. Shifts were applied as defined by measurements and were distributed by time. Open water measurements show shifts varied between -0.01 and +0.07 feet. All measurements were given full weight and applied except Nos. 558, 560, 564-567, 571, 573, 575, and 576, which were adjusted as much as five percent to smooth shift distribution.

Special Computations.--

Remarks.-- Record is good. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA

RATING TABLE-- CBPALACO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

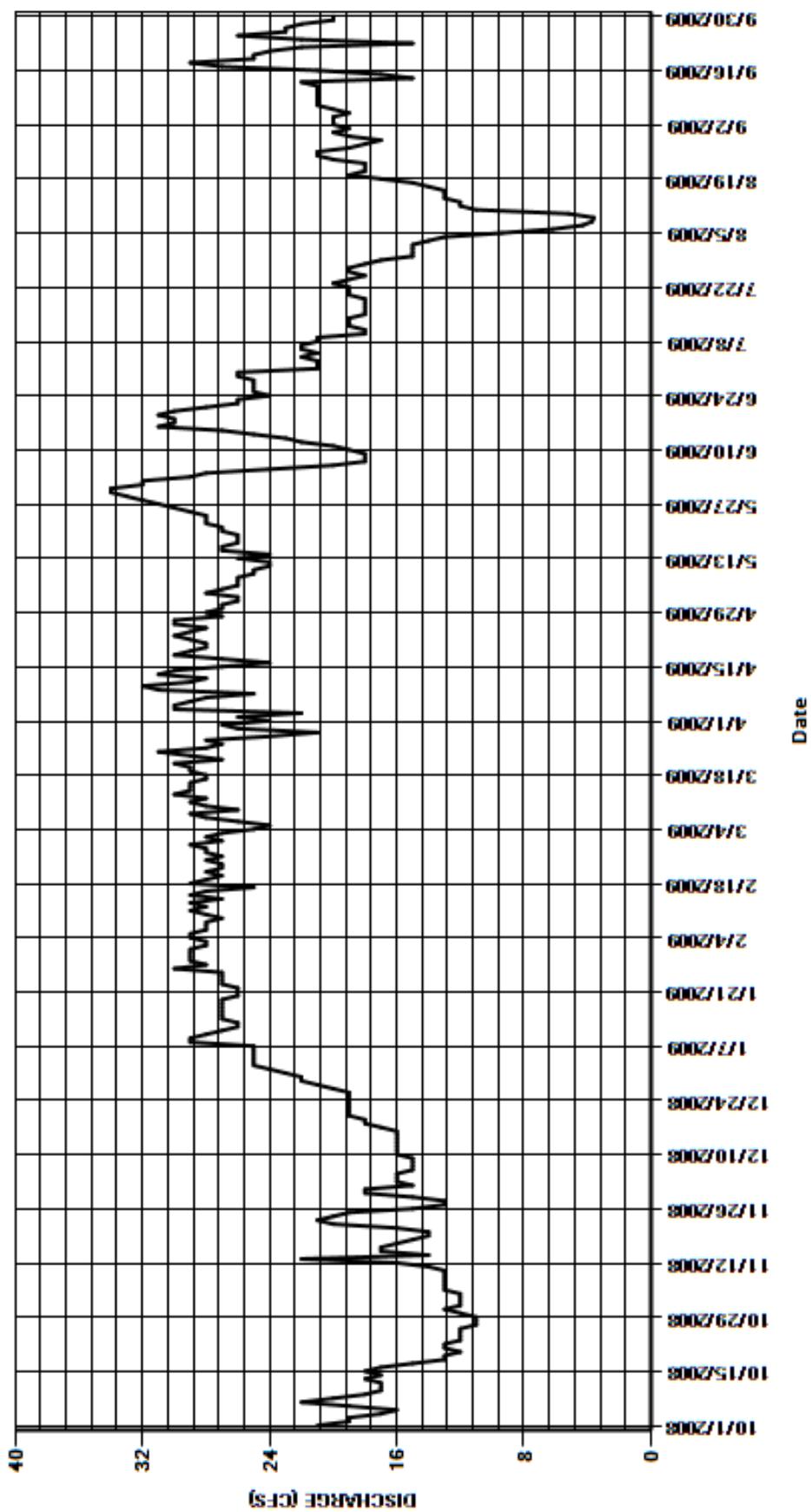
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	12	18	24	29	27	24	27	32	21	15	19
2	19	12	15	25	28	28	26	26	32	21	15	20
3	19	12	16	25	28	27	22	26	29	21	14	20
4	17	12	16	25	29	25	30	28	28	22	13	20
5	16	13	16	25	29	24	30	27	24	21	9.4	19
6	19	13	15	25	28	26	29	26	20	22	6.2	20
7	22	13	15	25	28	28	28	26	18	22	4.3	21
8	20	13	15	29	28	29	25	26	18	21	3.7	21
9	18	13	15	29	27	26	31	25	18	21	3.6	21
10	17	13	16	28	28	28	32	25	19	18	5.2	21
11	17	14	16	27	29	29	29	24	20	18	11	21
12	17	16	16	26	28	28	28	24	22	19	12	21
13	18	22	16	26	29	30	31	26	23	19	12	22
14	17	14	16	27	27	29	30	24	25	19	13	15
15	18	17	16	27	29	29	27	27	27	18	13	17
16	17	17	16	27	28	29	24	27	31	18	13	21
17	15	16	17	27	25	28	27	26	30	18	14	27
18	13	15	18	27	29	28	30	26	30	18	15	29
19	13	14	18	27	28	29	29	26	31	18	17	25
20	12	14	19	26	27	29	28	27	30	19	19	25
21	13	16	19	26	28	30	28	27	28	19	18	24
22	13	20	19	26	27	27	29	28	26	19	18	22
23	12	21	19	27	27	29	30	28	26	20	18	15
24	12	20	19	27	28	31	29	28	24	19	20	22
25	12	19	19	27	27	28	28	29	25	18	21	26
26	12	15	19	27	28	27	30	30	25	19	21	23
27	11	13	20	30	28	28	30	31	25	19	19	23
28	11	13	21	28	29	24	27	32	25	18	18	22
29	11	15	22	29	---	21	28	33	26	17	17	20
30	12	18	22	29	---	26	27	34	26	15	19	20
31	13	---	23	29	---	27	---	34	---	15	20	---
TOTAL	477	455	547	832	783	854	846	853	763	592	437.4	642
MEAN	15.4	15.2	17.6	26.8	28	27.5	28.2	27.5	25.4	19.1	14.1	21.4
AC-FT	946	902	1080	1650	1550	1690	1680	1690	1510	1170	868	1270
MAX	22	22	23	30	29	31	32	34	32	22	21	29
MIN	11	12	15	24	25	21	22	24	18	15	3.6	15
CAL YR	2008	TOTAL	7955.0	MEAN	21.7	MAX	38	MIN	6	AC-FT	15780	
WTR YR	2009	TOTAL	8081.4	MEAN	22.1	MAX	34	MIN	3.6	AC-FT	16030	

MAX DISCH: 36 CFS AT 16:00 ON May. 31,2009 GH 0.8 FT. SHIFT 0.05 FT. (GH CORR. -0.08 APPLIED)

MAX GH: 0.8 FT. AT 16:00 ON May. 31,2009 (GH CORR. -0.08 APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08224500 KERBER CREEK NEAR VILLA GROVE
Water Year 2009

Location.-- Lat. $38^{\circ}13'13''$, Long. $106^{\circ}05'20''$, UTM X 404609.1, Y 4230816.9, in SW $\frac{1}{4}$ SE $\frac{1}{4}$, sec. 21, T. 46 N., R. 8 E., Saguache County, on left bank 7 miles west of Villa Grove and 5 $\frac{1}{2}$ miles downstream from the town of Bonanza.

Drainage and Period of Record.-- 45.4 mi 2 (revised). (approx.) Originally established with staff gage only in 1911. Station at various locations from that time.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 6 ft. by 6 ft. exposed aggregate shelter and 48 inch concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable for the water year. Stage-discharge relation was affected by ice Nov. 7-11, 21-30, Dec. 1, 2008 through Feb. 28, 2009, Mar. 1-4, 8, 9, 11, 12, 27-29, 31, Apr. 1 and 2, 2009. There were no instrument corrections made to the shaft encoder.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on July 29, 2009 using B.M. No. 8 as base. The RP elevation was within the allowable limit, therefore, no correction was made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Control is a concrete ramp flume approximately 10 feet downstream from gage. Shifting occurred mainly due to the movement of streambed materials in the gage pool, especially at high stages. Rating No. 19 was used all year. Fifteen measurements (Nos. 104-118) were made this year ranging in discharge from 1.7 to 49.6 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 22-27, 2009. The peak flow of 81 cfs occurred at 22:00 on May 24, 2009 at a gage-height of 1.38 feet with a shift of 0 feet. It exceeded high measurement No. 113 (GH = 1.17), made June 3, 2009 by 0.21 feet in stage.

Discharge.-- Shifting control method was used for all open water periods. A variable shift curve (KERVILVS0901) was used to distribute shifts according to stage from March 4, 2009 until August 26, 2009. Measurements for the water year show shifts varied between 0.00 and +0.05 ft. All measurements were given full weight and applied, except Nos. 110, 111, and 118, which were adjusted as much as 4% to smooth shifts between measurements. Measurement No. 117 was rated fair and adjusted 7% to better fit the shift curve. Measurement No. 112 was rated poor and adjusted 12% to better fit the shift curve.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using six measurements, nearby stations and weather records. A hydrograph was used.

Remarks.-- The record is good except for periods of ice affected record, which should be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08224500 KERBER CREEK NEAR VILLA GROVE

RATING TABLE--

KERVILCO19 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.3	2.8	3.6	3.4	3	5.4	3.7	22	45	17	4.7	2.3
2	2.4	2.7	3.6	3.4	3.2	5.6	3.7	25	46	16	3.9	2.2
3	2.3	3.2	3.4	3.4	3.2	5.6	3.7	23	49	16	3.7	2.2
4	2.5	3.1	3	3.2	3.2	5	3.4	22	47	15	3.5	2.4
5	2.9	2.6	3	3.2	3.2	4.6	3.2	22	47	14	3.4	2.7
6	3.2	1.7	3	3.2	3.4	4.4	3.4	25	46	13	3.4	4.1
7	2.6	2.6	3.2	3.4	3.4	3.5	3.9	31	42	12	3.3	3.5
8	2.5	3	3.2	3.2	3.6	3.8	4.5	38	36	11	2.9	2.7
9	2.4	3.2	3	3.2	3.8	3.6	4.9	41	32	11	2.7	3
10	2.4	3.4	3	3.2	3.8	3.3	4.8	40	33	11	2.7	3.6
11	2.7	3.4	2.8	3.2	3.6	3.5	5.6	41	31	9.7	2.5	3.9
12	4	3.4	2.8	3.2	3.4	3.4	5	44	28	9.9	2.5	3.4
13	2.5	3.4	2.8	3.2	3.4	3.3	5.6	45	25	10	2.4	6
14	2.9	2.8	2.6	3.2	3.2	3.5	5.8	44	26	9.3	3.9	3.7
15	2.7	2.4	2.6	3	3.2	3.6	5.8	46	25	7.9	3.6	3.4
16	2.6	3.5	2.8	3	3.2	3.8	5.9	45	24	7.3	2.9	5.2
17	2.7	3.5	3	3	3.4	4.2	4.4	44	23	6.8	2.5	4.9
18	2.5	3.2	3	3	3.4	4.4	7.2	45	23	6.6	2.5	3.6
19	2.6	3	2.8	3	3.6	4.8	6.9	46	22	6.3	2.4	3.5
20	2.6	2.9	2.8	3.2	3.6	4.9	9.1	45	26	6.2	2.2	3.5
21	2.8	2.7	2.8	3.2	4	4.8	10	49	26	6.4	2.2	3.7
22	2.3	2.6	3	3.2	4.6	5.6	11	53	23	6.5	2.2	3.8
23	2.4	2.6	3	3.2	5.2	5.5	12	61	23	6.3	2.2	4
24	2.9	2.7	3.2	3.4	5.4	4.4	12	68	23	5.6	3	4.7
25	3.1	2.8	3.2	3.4	5.4	4.3	14	69	22	5.4	4.8	4.7
26	3	3	3	3.2	5.4	3.6	15	63	25	6.8	3.9	4
27	2.7	3.2	3	3.2	5.2	3.6	14	55	23	6.1	2.6	3.5
28	2.8	3.4	3	3	5	3.8	15	48	21	5	2.3	3.3
29	2.8	3.6	3.2	3	---	3.6	15	47	20	5	2.2	3.2
30	2.8	3.6	3.2	3	---	3.6	18	46	18	4.8	2.2	3.3
31	2.7	---	3.2	3	---	3.5	---	45	---	5.2	2.6	---
TOTAL	83.6	90.0	93.8	98.6	108.0	130.5	236.5	1338	900	279.1	91.8	108.0
MEAN	2.7	3	3.03	3.18	3.86	4.21	7.88	43.2	30	9	2.96	3.6
AC-FT	166	179	186	196	214	259	469	2650	1790	554	182	214
MAX	4	3.6	3.6	3.4	5.4	5.6	18	69	49	17	4.8	6
MIN	2.3	1.7	2.6	3	3	3.3	3.2	22	18	4.8	2.2	2.2

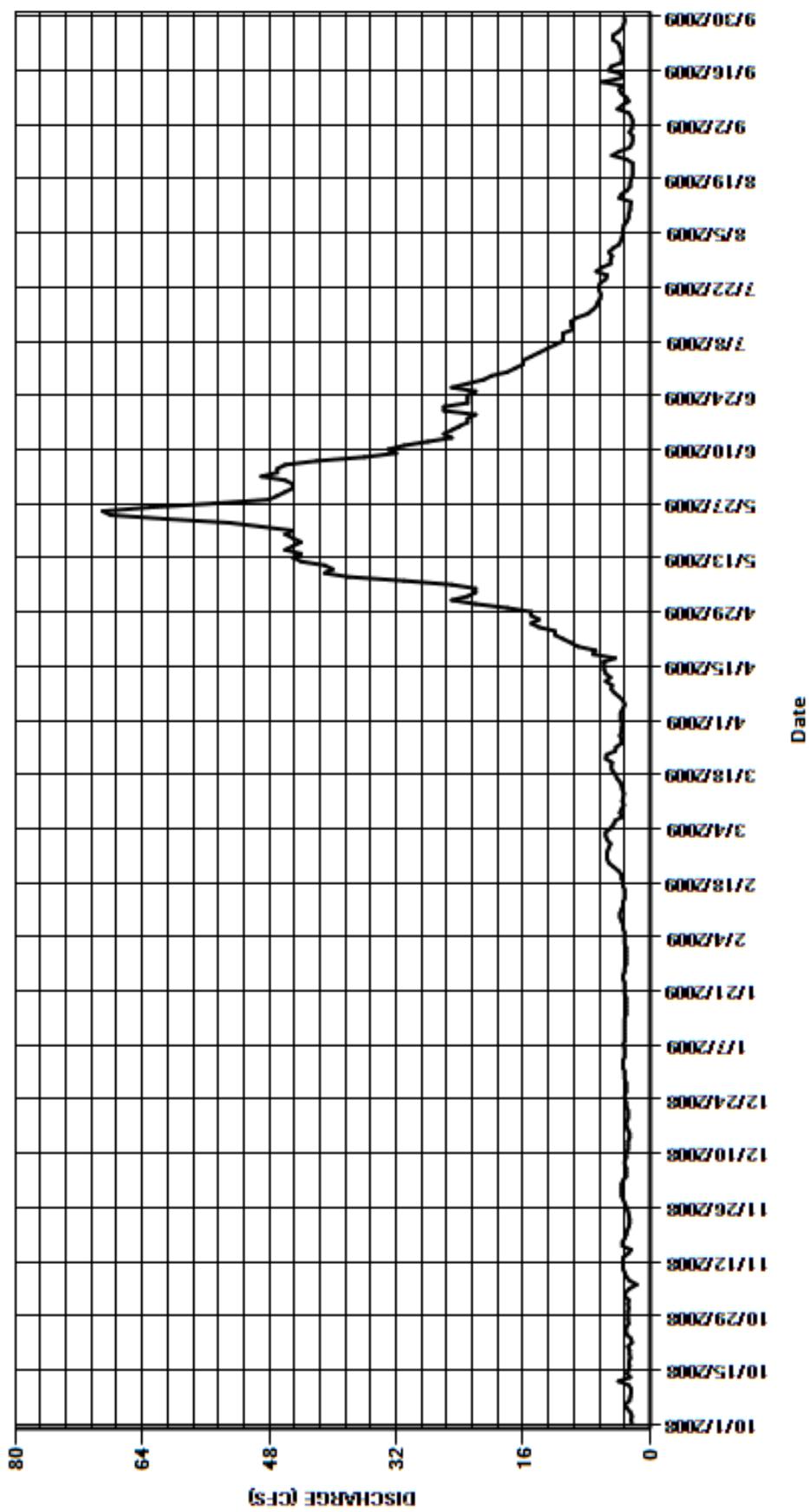
CAL YR	2008	TOTAL	4350.6	MEAN	11.9	MAX	87	MIN	1.6	AC-FT	8630
WTR YR	2009	TOTAL	3557.9	MEAN	9.75	MAX	69	MIN	1.7	AC-FT	7060

MAX DISCH: 81 CFS AT 22:00 ON May. 24,2009 GH 1.38 FT. SHIFT 0 FT.

MAX GH: 1.38 FT. AT 22:00 ON May. 24,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08224500 KERBER CREEK NEAR VILLA GROVE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
GARNER CREEK NEAR VILLA GROVE
Water Year 2009

Location.-- Lat. 38°10'27", Long. 105°48'29", UTM X 429172.3, Y 4225448.3, in SE ¼ SE ¼ Sec. 1, T.45 N., R.10 E., NMPM, Saguache Co., on right bank, 12 miles SE of Villa Grove.

Drainage and Period of Record.-- 6.4 mi².

Equipment.-- Data collection platform (Sutron Model 8200) and a float-operated shaft encoder in a 2 foot steel culvert pipe stilling well with a small steel box-type shelter atop well. Control is a 2.5 ft Parshall Flume. Primary reference gage is staff gage in flume. On Aug. 10, 2009 the DCP and shaft encoder were upgraded to Sutron Model Satlink Logger with HDR GOES radio and float-operated SDR.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log as backup. Record is complete and reliable except for Dec. 10-22, 2008 when the well was frozen and Dec. 23, 2008 through March 18, 2009 when the station was closed for the winter. Stage-discharge relation was affected by ice Dec. 5-9, 2008 and Mar. 31, Apr. 5, 6, 2009. There was one -0.02 ft instrumentation correction made to the shaft encoder. This correction was prorated by time from previous visit. There was also a -0.01 ft cleaning correction that was prorated back to the previous visit and a flush correction of -0.01 ft that was carried back to the last point of inflection.

Datum Corrections.-- A formal inspection with levels was not performed this year. Last year's inspection and levels, completed on the 2 foot Parshall flume on Jul. 24, 2008, indicate that the flume floor slopes down from the LEW at the staff to the inlet by approximately 0.16 ft (±4.5%). Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- The flume and well ice up during winter, and sediment movement in and above control can cause minor shifting. Rating No. 1, a standard two foot Parshall flume rating, was used all year. Fourteen discharge measurements (Nos. 144-157) were made this year, ranging in discharge from 1.60 to 5.11 cfs. They cover the discharge range experienced except for lower daily flows on Dec. 8-11, 14-16, 21-31, 2008, Jan. 1, 2, 6, 7, 10-14, Feb. 14, 15, Apr. 1-3, 2009; and higher daily flows on May 26, 28, Jun. 27, 2009. The peak flow of 6.68 cfs occurred at 3:15 on Jun. 27, 2009 at a gage-height of 0.80 ft with a shift of +0.09 ft. It exceeded high measurement No. 152(GH 0.62 ft) made May 5, 2009 by 0.18 ft in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts varied from +0.06 to +0.13 feet. All measurements were given full weight except Nos. 144, 150, 153 and 156, which were adjusted by as much as 10% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using four discharge measurements, weather records, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

GARNER CREEK NEAR VILLA GROVE

RATING TABLE--

GARVILCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	1.8	1.8	1.4	1.6	1.7	1.2	2.8	5.1	4	2.4	1.8
2	1.9	1.8	1.8	1.5	1.7	1.6	1.2	2.9	4.8	4	2.3	1.8
3	1.9	1.8	1.8	1.6	1.7	1.6	1.2	2.4	4.8	4	2.2	1.8
4	2	1.9	1.8	1.6	1.8	1.7	1.8	2.1	4.5	3.9	2.2	1.8
5	2.1	1.9	1.8	1.6	1.8	1.8	1.9	2.4	4.3	3.9	2.2	1.9
6	2.1	1.7	1.7	1.5	1.8	1.8	1.9	2.7	4.2	3.8	2.2	1.8
7	2.1	1.7	1.6	1.5	1.8	1.7	1.9	2.7	4.1	3.7	2.1	1.8
8	2.1	1.8	1.5	1.6	1.8	1.7	1.8	2.6	4	3.5	2	1.8
9	2.1	1.9	1.5	1.6	1.7	1.7	1.8	2.6	4	3.4	2	1.8
10	2.1	1.9	1.5	1.5	1.7	1.7	1.8	2.7	4	3.3	1.9	1.8
11	2.1	1.9	1.5	1.4	1.6	1.7	1.9	2.8	4	3.3	1.8	1.8
12	2.3	1.9	1.6	1.4	1.6	1.6	1.8	2.8	3.9	3.1	1.8	1.9
13	2.1	1.9	1.6	1.5	1.6	1.6	2	2.9	3.7	3	1.7	2
14	2.1	1.9	1.5	1.5	1.5	1.6	2	2.9	3.5	2.9	1.8	1.9
15	2.2	1.8	1.5	1.6	1.5	1.7	1.9	3	3.5	2.8	1.8	1.8
16	2.1	1.8	1.5	1.6	1.6	1.8	2	3.1	3.5	2.8	1.7	2
17	2.1	1.9	1.6	1.6	1.7	1.9	1.7	3.1	3.4	2.7	1.7	1.9
18	2	1.9	1.6	1.7	1.7	2	2	3.5	3.2	2.6	1.8	1.9
19	1.9	1.9	1.6	1.7	1.6	2.1	2.1	3.9	3.2	2.6	1.9	1.9
20	1.9	1.8	1.6	1.7	1.6	2	2.3	4.3	3.8	2.6	1.9	1.8
21	2	1.9	1.5	1.7	1.6	1.9	2.4	4.9	4.1	2.5	1.9	1.8
22	1.9	1.8	1.5	1.7	1.7	2	2.3	4.8	3.8	2.6	1.9	1.9
23	1.9	1.8	1.5	1.8	1.7	2	2.4	5	3.6	2.5	1.8	1.9
24	1.9	1.7	1.5	1.8	1.8	1.9	2.5	5	3.2	2.5	2.1	1.9
25	1.9	1.8	1.5	1.8	1.8	1.9	2.6	5.1	3.2	2.4	2.1	2
26	2	1.8	1.5	1.8	1.8	1.8	2.6	5.3	3.5	2.6	1.8	1.8
27	1.9	1.9	1.5	1.8	1.8	2.1	2.6	5.1	5.5	2.5	1.7	1.8
28	1.9	1.9	1.4	1.7	1.7	2.1	2.6	5.3	4.7	2.4	1.8	1.8
29	1.8	1.9	1.3	1.6	---	2	2.6	4.9	4.4	2.4	1.9	1.7
30	1.9	1.9	1.3	1.6	---	1.9	2.7	4.8	4.2	2.4	1.9	1.7
31	1.8	---	1.4	1.6	---	1.6	---	4.9	---	2.4	1.9	---
TOTAL	62.0	55.3	48.3	50.0	47.3	56.2	61.5	113.3	119.7	93.1	60.2	55.3
MEAN	2	1.84	1.56	1.61	1.69	1.81	2.05	3.65	3.99	3	1.94	1.84
AC-FT	123	110	96	99	94	111	122	225	237	185	119	110
MAX	2.3	1.9	1.8	1.8	1.8	2.1	2.7	5.3	5.5	4	2.4	2
MIN	1.8	1.7	1.3	1.4	1.5	1.6	1.2	2.1	3.2	2.4	1.7	1.7

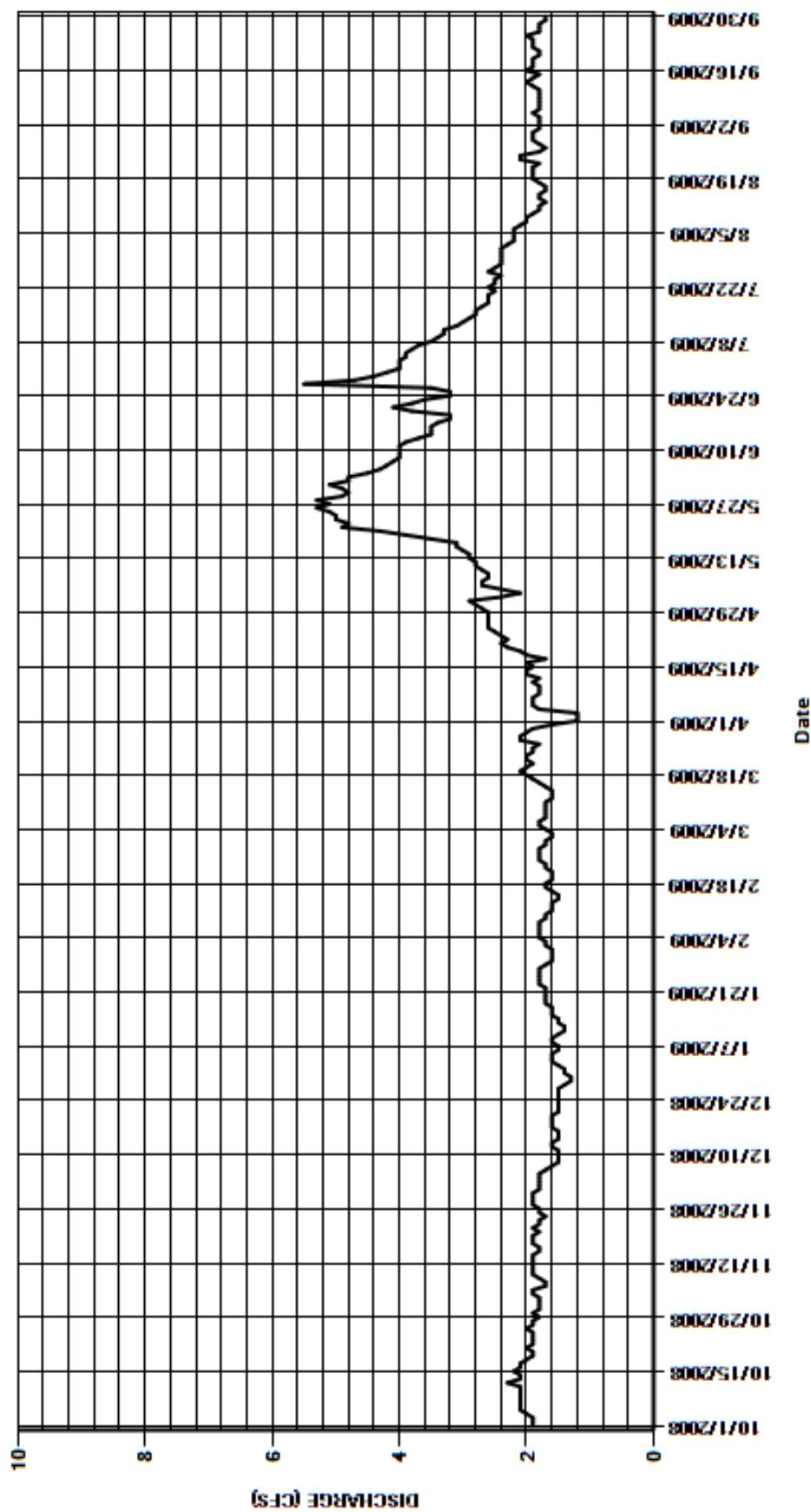
CAL YR	2008	TOTAL	725.6	MEAN	1.98	MAX	3	MIN	1.3	AC-FT	1440
WTR YR	2009	TOTAL	822.2	MEAN	2.25	MAX	5.5	MIN	1.2	AC-FT	1630

MAX DISCH: 6.7 CFS AT 03:15 ON Jun. 27,2009 GH 0.8 FT. SHIFT 0.09 FT.

MAX GH: 0.8 FT. AT 03:15 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

GARNER CREEK NEAR VILLA GROVE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
MAJOR CREEK NEAR VILLA GROVE
Water Year 2009

Location.-- Lat. 38°09'26", Long. 105°48'32", UTM X 429083.2, Y 4223568.3, in NE ¼ NE ¼ Sec. 13, T.45 N., R.10 E., NMPM, Saguache Co., on right bank, 11 miles SE of Villa Grove.

Drainage and Period of Record.-- 5.0 mi².

Equipment.-- Data collection platform (Sutron Model 8200) and a float-operated shaft encoder in a 2 foot steel culvert pipe stilling well with a small steel box-type shelter atop well. On Aug. 10, 2009 the DCP and shaft encoder were upgraded to Sutron Model Satlink Logger with HDR GOES radio and SDR. Control is a 2 foot Parshall flume, Primary reference gage is staff gage in the flume.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log as backup. Record is complete and reliable except for Dec. 10-22, 2008 when the well was frozen and Dec. 23, 2008 through Mar. 18, 2009 when the station was closed for the winter. Stage-discharge relation was affected by ice Nov. 6, 7, 15, 22, 24-26, 29, Dec. 4, 5, 9, 2008 and Mar. 27, 28, 31, Apr. 2, 5, 6, 2009. There was one -0.02 ft. instrument correction made to the shaft encoder on July 23, 2009 combined with a cleaning correction of -0.01 ft. These were both prorated back to the previous visit. There was also a +0.01 ft. flush correction on Jun. 17, 2009, which was ran back to the previous point of inflection.

Datum Corrections.-- A formal inspection with levels was not performed this year. Last year's inspection and levels were completed on July 24, 2008, with an assumed elevation of 0.000 at the flume staff gage (LEW) which is opposite the stilling well inlet (REW). Levels indicate that the flume floor slopes down from the LEW at the staff to the inlet by approximately 0.062 ft (Approx. 2%). The floor also slopes to the throat by 0.038 ft. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- Control is a 2 foot Parshall flume in good condition. The flume and well ice up during winter, and sediment movement in and above control can cause minor shifting. Rating No. 1, a standard two foot Parshall flume rating, was used all year. Fourteen measurements (Nos. 145-158) were made this year ranging in discharge from 0.88 to 3.24 cfs. They cover the discharge range experienced except for the lower daily flows on Oct. 24-26, 2008, March 19, 20, 22, 24, 26, 27, 30, April 5-10, 12, 17, 18, 2009; and the higher daily flows on June 27-30, July 1-7, 2009. The peak flow of 7.39 cfs occurred at 03:30 on Jun. 27, 2009 at a gage-height of 0.97 feet with a shift of -0.02 feet. It exceeded high measurement No. 155, made July 6, 2009 at a gage-height of 0.58 feet by 0.39 feet in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by discharge measurements and distributed by time. Open water measurements show shifts varied between -0.02 ft. and +0.02 ft. All measurements were given full weight except for Nos. 145 and 146 which were adjusted as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five discharge measurements, weather records, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MAJOR CREEK NEAR VILLA GROVE

RATING TABLE--

MAJVILCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

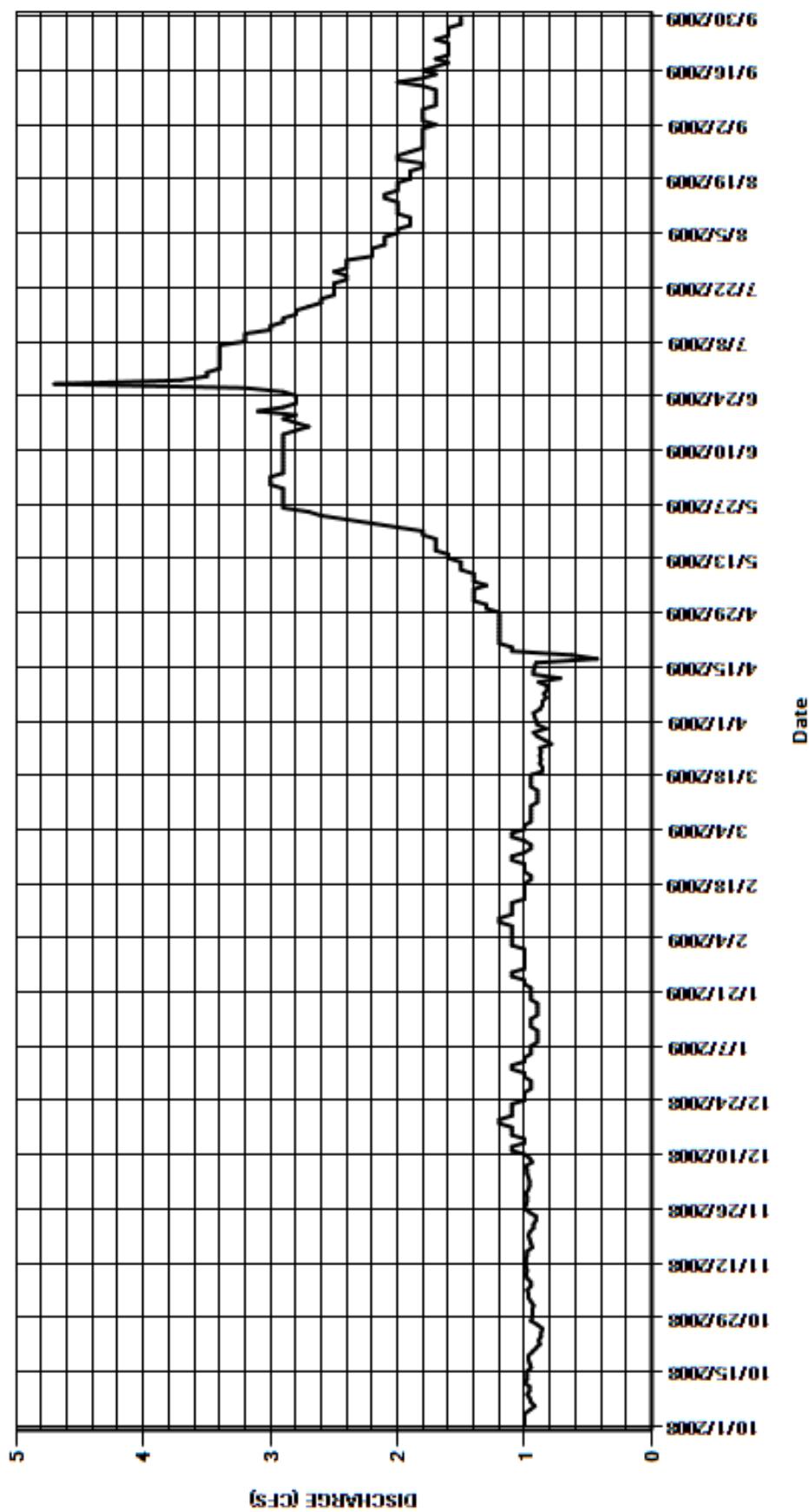
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1	0.93	0.97	1.1	1	1	0.91	1.3	3	3.4	2.2	1.8
2	1	0.95	0.96	1.1	1.1	1.1	0.92	1.4	3	3.4	2.1	1.7
3	1	0.97	0.96	1	1.1	1.1	0.93	1.4	3	3.4	2.1	1.8
4	1	0.97	0.97	1	1.1	1	0.88	1.4	2.9	3.4	2.1	1.8
5	0.96	0.98	0.98	0.95	1.1	1	0.86	1.4	2.9	3.4	2	1.8
6	0.92	0.95	0.98	0.95	1.1	0.95	0.86	1.3	2.9	3.4	2	1.8
7	0.95	0.95	0.99	0.95	1.1	0.95	0.83	1.4	2.9	3.4	1.9	1.7
8	0.96	0.98	0.94	0.9	1.2	0.95	0.85	1.4	2.9	3.2	1.9	1.7
9	0.98	0.99	0.96	0.9	1.2	0.95	0.82	1.4	2.9	3.2	1.9	1.7
10	0.96	0.98	1	0.9	1.1	0.95	0.82	1.5	2.9	3.2	2	1.7
11	0.96	0.99	1.1	0.9	1.1	0.9	0.89	1.5	2.9	3	2	1.7
12	1	0.99	1.1	0.95	1.1	0.9	0.72	1.5	2.9	3	2	1.8
13	0.98	0.99	1	0.95	1.1	0.9	0.93	1.6	2.9	2.9	2	2
14	0.98	0.98	1	0.95	1	0.9	0.93	1.6	2.9	2.9	2.1	1.8
15	0.98	0.98	1.1	0.9	1	0.95	0.92	1.7	2.8	2.8	2.1	1.7
16	0.95	0.94	1.1	0.9	1	0.95	0.91	1.7	2.7	2.8	2	1.8
17	0.96	0.95	1.1	0.9	1	0.95	0.43	1.7	2.8	2.7	2	1.7
18	0.97	0.96	1.2	0.9	1	0.95	0.63	1.7	2.9	2.6	2	1.6
19	0.97	0.97	1.2	0.95	0.95	0.86	1.1	1.8	2.8	2.6	1.9	1.7
20	0.94	0.96	1.1	0.95	0.95	0.86	1.1	1.8	3.1	2.5	1.9	1.6
21	0.91	0.93	1.1	0.95	1	0.88	1.2	2	2.9	2.5	1.9	1.6
22	0.88	0.93	1.1	0.95	1	0.87	1.2	2.2	2.8	2.5	1.8	1.6
23	0.89	0.91	1.1	1	1	0.88	1.2	2.4	2.8	2.5	1.8	1.6
24	0.87	0.91	1	1	1.1	0.87	1.2	2.6	2.8	2.4	2	1.7
25	0.87	0.96	1	1.1	1.1	0.88	1.2	2.7	2.9	2.4	2	1.6
26	0.86	1	1	1.1	1	0.79	1.2	2.9	3.2	2.5	1.9	1.6
27	0.9	0.99	0.95	1	0.95	0.84	1.2	2.9	4.7	2.4	1.8	1.6
28	0.95	0.98	0.95	1	0.95	0.9	1.2	2.9	3.7	2.4	1.8	1.5
29	0.94	0.98	0.95	1	---	0.93	1.2	2.9	3.5	2.4	1.8	1.5
30	0.94	0.99	1	1	---	0.83	1.3	2.9	3.5	2.2	1.8	1.5
31	0.94	---	1	1	---	0.9	---	2.9	---	2.2	1.8	---
TOTAL	29.37	28.94	31.86	30.10	29.40	28.64	29.34	59.8	90.8	87.6	60.6	50.7
MEAN	0.95	0.96	1.03	0.97	1.05	0.92	0.98	1.93	3.03	2.83	1.95	1.69
AC-FT	58	57	63	60	58	57	58	119	180	174	120	101
MAX	1	1	1.2	1.1	1.2	1.1	1.3	2.9	4.7	3.4	2.2	2
MIN	0.86	0.91	0.94	0.9	0.95	0.79	0.43	1.3	2.7	2.2	1.8	1.5
CAL YR	2008	TOTAL	431.53	MEAN	1.18	MAX	1.7	MIN	0.8	AC-FT	856	
WTR YR	2009	TOTAL	557.15	MEAN	1.53	MAX	4.7	MIN	0.43	AC-FT	1110	

MAX DISCH: 7.4 CFS AT 03:30 ON Jun. 27,2009 GH 0.97 FT. SHIFT -0.02 FT.

MAX GH: 0.97 FT. AT 03:30 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MAJOR CREEK NEAR VILLA GROVE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS
Water Year 2009

Location.-- Lat. 38°07'55", Long. 105°47'15", UTM X 430884.8, Y 4220748.2, in Sec. 20, T.45 N., R.11 E., NMPM, Saguache Co., on left bank of channel approximately 300 feet North of road, 9 miles SE of Mineral Hot Springs.

Drainage and Period of Record.-- 12.8 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a 48 inch diameter metal shelter and well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except when the station was closed for the winter November 26, 2008 through March 19, 2009 and July 5, 6, 2009 when the inlets were plugged. Stage-discharge relationship was affected by ice March 27-29, 31, 2009. There was one instrumentation correction made to the shaft encoder of +0.01 feet. This correction was prorated by time from previous visit. There were two flush corrections that were prorated from the previous point of inflection.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on September 4, 2009 using B.M. No. 2 as base. The gage reference point elevation was within allowable limits, therefore no correction was made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- The control at all stages is rock piled in stream channel 10 feet below gage. Some minor shifting of control will occur from movement of rocks. The rock weir was modified on May 22, 2008 by relocating the large boulders that had moved due to ice and debris. Rating No. 04-1 was developed and used this water year. Eighteen discharge measurements (Nos. 150-167) were made during the year ranging in discharge from 4.58 to 67.9 cfs. They cover the range experienced except for the lower daily flows on Feb. 28, March 1, 9-16, 26, 28-31, April 1- 3, 5, 2009 and the higher daily flow on Jun. 26, 27, 2009. The peak flow of 113 cfs occurred at 00:45 on June 27, 2009 at a gage-height of 4.12 ft. with a shift of 0 ft. It exceeded high measurement No. 162 (GH=3.76 ft), made June 26, 2009, by 0.36 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. These shifts were defined by measurements and distributed by time. All shifts were given full weight and applied as defined except for Nos. 155, 159, 161, and 163, which were adjusted by as much as 5% to smooth shift distribution. Measurement No. 166 was rated fair and adjusted by 7% to smooth shift distribution. Measured shifts ranged from -0.04 to +0.02 feet.

Special Computations.-- Discharge for periods of no gage height and ice affected record was estimated using six discharge measurements, and weather records. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height, and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS

RATING TABLE--

COCRMICO04-1 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.8	7.2	5.9	5.4	4.8	4.4	3.9	9.1	31	28	17	10
2	8.2	7.1	5.9	5.4	5	4.6	3.6	9.7	29	28	16	10
3	8	7.1	5.9	5.6	5	4.8	3.7	9.3	30	27	16	10
4	7.7	7.1	5.7	5.4	5	4.8	4.6	8.3	32	24	15	10
5	7.7	7	5.9	5	5	5	4.2	8.1	34	24	15	11
6	7.7	6.2	5.9	4.6	5	5	4.6	9	35	27	14	11
7	7.7	6.6	5.9	4.8	5.2	4.8	4.8	12	30	27	14	11
8	7.7	7.2	5.9	4.8	5.2	4.6	4.7	14	28	25	14	10
9	7.5	7.1	5.7	4.8	5	4.2	4.7	16	27	23	13	10
10	7.4	7.1	5.9	4.8	4.8	4.2	4.8	17	25	22	13	11
11	7.6	7.1	5.9	5	4.8	4.2	5.2	19	24	21	13	10
12	9	7	6.1	5	4.8	4.2	5	22	22	21	13	10
13	8.1	7.1	6.2	5.2	4.8	4.2	5.4	24	23	20	13	12
14	8.1	7	6.4	5.2	4.8	4.2	5.2	24	26	19	15	11
15	8	6.6	6.2	5.4	4.8	4.4	5.2	27	29	19	14	10
16	8	6.9	6.4	5.4	4.8	4.4	5.3	28	29	18	13	11
17	7.8	6.7	6.4	5.4	4.8	4.6	4.8	29	31	17	13	12
18	7.7	6.5	6.4	5.6	4.8	4.6	6	35	33	18	12	11
19	7.5	6.5	6.4	5.6	4.8	4.6	5.6	40	35	17	12	11
20	7.4	6.5	6.2	5.6	5	4.9	5.7	40	43	17	12	11
21	7.4	6.5	6.2	5.6	5	5	6.2	34	44	17	12	11
22	7.3	6.3	6.4	5.6	5	5.2	6.6	35	45	17	12	11
23	6.9	6.3	6.4	5.4	5	5.3	6.6	35	41	17	11	12
24	7.3	6	6.4	5.4	5	5	6.8	35	36	17	12	12
25	7.3	6.3	6.6	5.2	5	4.9	7	31	42	16	12	12
26	7.4	6.3	6.2	5	4.8	4.5	6.9	28	79	20	12	11
27	7.3	6.3	5.6	4.8	4.6	4.6	6.7	26	73	21	11	11
28	7.4	6.3	5.2	4.6	4.4	4.4	6.7	27	42	18	11	10
29	7.3	6.1	5.2	4.6	---	4.2	7.1	27	36	18	11	9.9
30	7.2	6.1	5.2	4.6	---	4.3	8.4	27	31	18	11	10
31	7.3	---	5.4	4.8	---	3.8	---	32	---	18	11	---
TOTAL	236.7	200.1	186.0	159.6	137.0	141.9	166.0	737.5	1065	639	403	322.9
MEAN	7.64	6.67	6	5.15	4.89	4.58	5.53	23.8	35.5	20.6	13	10.8
AC-FT	469	397	369	317	272	281	329	1460	2110	1270	799	640
MAX	9	7.2	6.6	5.6	5.2	5.3	8.4	40	79	28	17	12
MIN	6.9	6	5.2	4.6	4.4	3.8	3.6	8.1	22	16	11	9.9

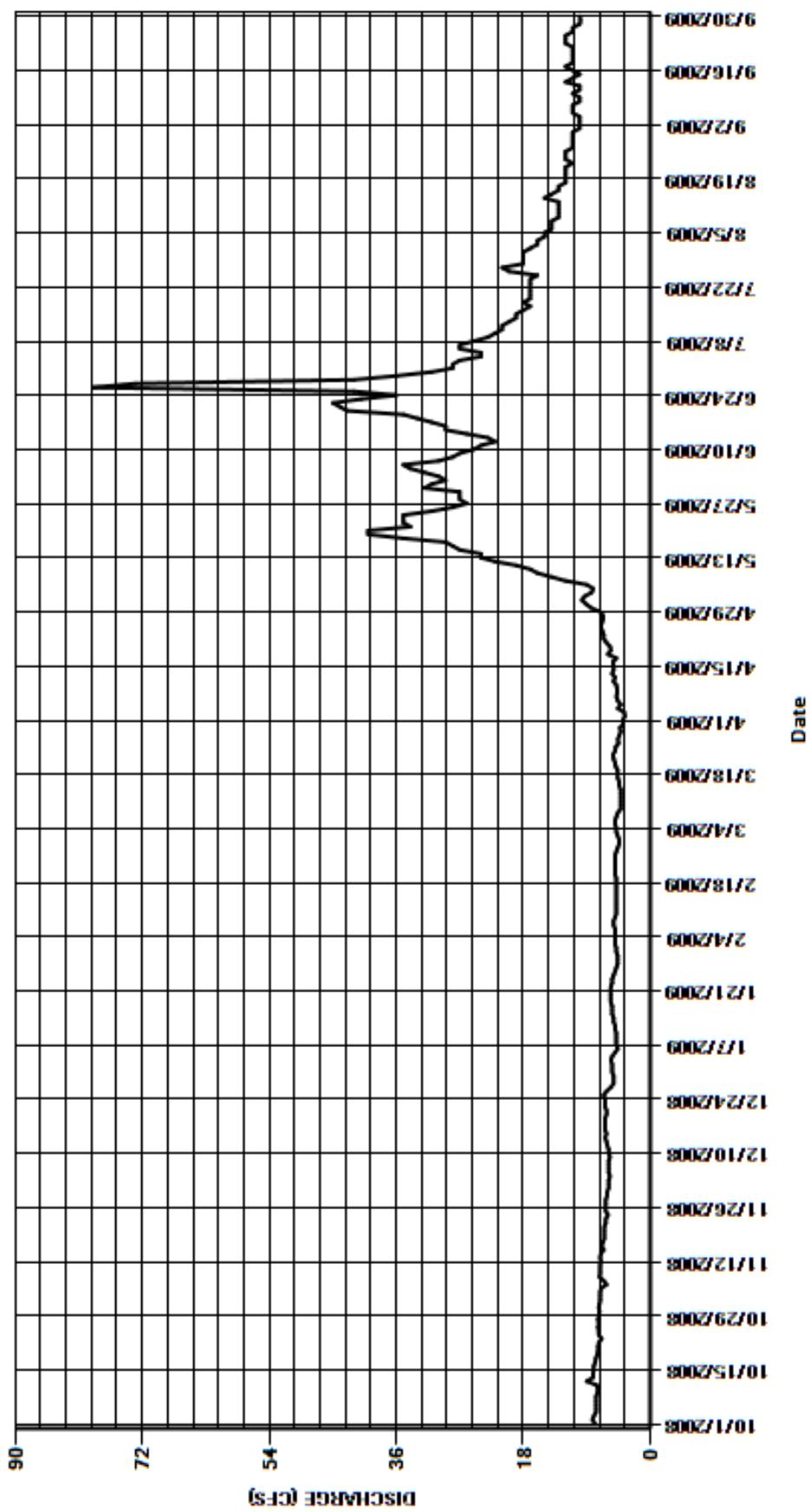
CAL YR	2008	TOTAL	3667.9	MEAN	10	MAX	37	MIN	4	AC-FT	7280
WTR YR	2009	TOTAL	4394.7	MEAN	12	MAX	79	MIN	3.6	AC-FT	8720

MAX DISCH: 113 CFS AT 00:45 ON Jun. 27,2009 GH 4.12 FT. SHIFT 0 FT.

MAX GH: 4.12 FT. AT 00:45 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
WILD CHERRY CREEK NEAR CRESTONE
Water Year 2009

Location.-- Lat. 38°06'01", Long. 105°46'04", UTM X 432633.1, Y 4217219.0, SW ¼ SW ¼ Sec. 33, T.45 N., R.11 E., N.M.P.M., Saguache Co., on right bank of channel approximately 50 feet North of right branch of trail, 12 miles SE of Mineral Hot Springs, 8 miles NW of Crestone.

Drainage and Period of Record.-- 4.5 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 4-foot diameter culvert pipe well and shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and chart record as backups. Record is complete and reliable except for Nov. 25, 2008, Apr. 1-6, 2009 when floats were affected by ice in well, and Nov. 26, 2008 through Mar. 19, 2009 when station was closed for the winter, and Jun. 27 – Jul. 6, 2009 when the inlets were plugged. The stage-discharge relation was affected by ice Mar. 26-28, 30, 31, Apr. 12, 17, 2009. There were no instrumentation corrections made to the shaft encoder. There were three flush corrections ranging from +0.01 to +0.03 feet, which were prorated from a previous inflection point.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Sep. 4, 2009 using B.M. 1 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Control at all stages is a rock weir about 3 feet below the gage. Shifting occurs due to scour, fill, and movement of rocks. Rating No. 2 was used for the entire year. Sixteen discharge measurements (Nos. 150-165) were made this year ranging in discharge from 0.37 to 16.6 cfs. They cover the discharge range experienced except for lower daily flows on Jan. 29-31, Feb. 1-3, 10-16, 19-21, 27, 28, Mar. 1, 7-17, 2009; and higher daily flows on May 18-20, 2009. The peak flow of 24.4 cfs occurred at 21:00 on May 19, 2009 at a gage-height of 2.53 ft. with a shift of 0 ft. It exceeded high measurement No. 159 (GH=2.45 ft), made May 28, 2009, by 0.08 ft. in stage.

Discharge.-- Shifting control method was used during all open water periods. Two shift curves were used to apply shifts according to stage during the periods of Apr. 15 to May 14 and May 28 to Aug. 13, 2009. During other periods, shifts were applied as defined by measurements and distributed by time and events. Measurements show shifts varied from -0.03 to +0.08 feet. All were given full weight except for Nos. 155, 156 and 158-161, which were adjusted by as much as 8% to smooth shift distribution.

Special Computations.-- Periods of no gage-height and ice affected record were estimated using six discharge measurements, weather records, and comparison with nearby stations Rito Alto Creek near Crestone and San Isabel Creek near Crestone. A hydrograph was used.

Remarks.-- Due to instability of control and uncertainty in measurements, record is fair except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILD CHERRY CREEK NEAR CRESTONE

RATING TABLE--

CHECRECO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.99	1	0.8	0.6	0.3	0.3	0.4	4.5	14	10	2.7	0.92
2	0.98	1	0.8	0.6	0.3	0.4	0.4	5	14	9.5	2.5	0.89
3	1	1	0.8	0.6	0.3	0.5	0.4	4.2	15	9	2.4	0.9
4	0.96	1	0.7	0.6	0.4	0.5	0.4	3.8	15	8.5	2.3	0.9
5	0.93	0.96	0.7	0.6	0.4	0.5	0.4	3.6	16	8.1	2.2	0.93
6	0.97	0.84	0.7	0.5	0.4	0.4	0.4	4.2	15	7.7	2.1	0.9
7	0.91	0.85	0.7	0.5	0.5	0.3	0.51	6.5	13	7.3	2	0.89
8	0.91	0.91	0.7	0.6	0.5	0.3	0.53	9	12	6.9	1.9	0.87
9	0.92	0.87	0.7	0.6	0.4	0.3	0.52	9.9	11	6.5	1.8	0.89
10	0.91	0.86	0.6	0.5	0.3	0.3	0.52	9.3	9.7	6.2	1.7	0.89
11	0.93	0.86	0.6	0.4	0.3	0.3	0.6	11	9.1	5.9	1.4	0.88
12	1.2	0.86	0.6	0.4	0.3	0.3	0.55	12	8.5	5.6	1.4	0.91
13	1	0.85	0.6	0.5	0.3	0.3	0.68	13	8.6	5.5	1.5	0.97
14	0.95	0.83	0.6	0.5	0.3	0.3	0.67	15	9	5.1	1.7	0.92
15	0.96	0.8	0.6	0.5	0.3	0.3	0.7	15	8.9	4.9	1.7	0.89
16	0.95	0.83	0.6	0.5	0.3	0.3	0.74	15	9	4.6	1.5	0.93
17	0.89	0.82	0.6	0.5	0.4	0.3	0.8	16	9.9	4.3	1.3	0.98
18	0.91	0.8	0.7	0.5	0.4	0.4	0.89	18	10	4.1	1.2	0.95
19	0.91	0.8	0.7	0.6	0.3	0.4	0.85	20	10	4	1.2	0.91
20	0.95	0.8	0.6	0.6	0.3	0.44	1.1	19	12	3.8	1.2	0.91
21	0.98	0.79	0.6	0.6	0.3	0.45	1.7	17	13	3.7	1.1	0.92
22	0.98	0.77	0.6	0.6	0.4	0.51	2.5	15	13	3.7	1.1	0.94
23	0.93	0.78	0.6	0.6	0.5	0.52	2.7	15	12	3.6	1.1	0.98
24	0.98	0.7	0.5	0.7	0.5	0.44	3	15	11	3.5	1.2	0.98
25	0.98	0.7	0.5	0.7	0.5	0.42	3.1	13	11	3.2	1.3	0.98
26	0.98	0.8	0.5	0.6	0.4	0.4	3	14	14	3.4	1.2	0.96
27	0.98	0.8	0.5	0.5	0.3	0.4	2.8	14	14	3.3	1.1	0.95
28	1	0.8	0.4	0.4	0.3	0.4	2.8	16	13	3	0.99	0.91
29	1	0.8	0.4	0.3	---	0.52	2.9	15	12	3	0.95	0.91
30	1	0.8	0.5	0.3	---	0.5	3.9	14	11	2.9	0.96	0.93
31	1	---	0.5	0.3	---	0.4	---	15	---	2.9	0.95	---
TOTAL	29.94	25.28	19.00	16.30	10.20	12.10	40.46	377.0	353.7	163.7	47.65	27.69
MEAN	0.97	0.84	0.61	0.53	0.36	0.39	1.35	12.2	11.8	5.28	1.54	0.92
AC-FT	59	50	38	32	20	24	80	748	702	325	95	55
MAX	1.2	1	0.8	0.7	0.5	0.52	3.9	20	16	10	2.7	0.98
MIN	0.89	0.7	0.4	0.3	0.3	0.3	0.4	3.6	8.5	2.9	0.95	0.87

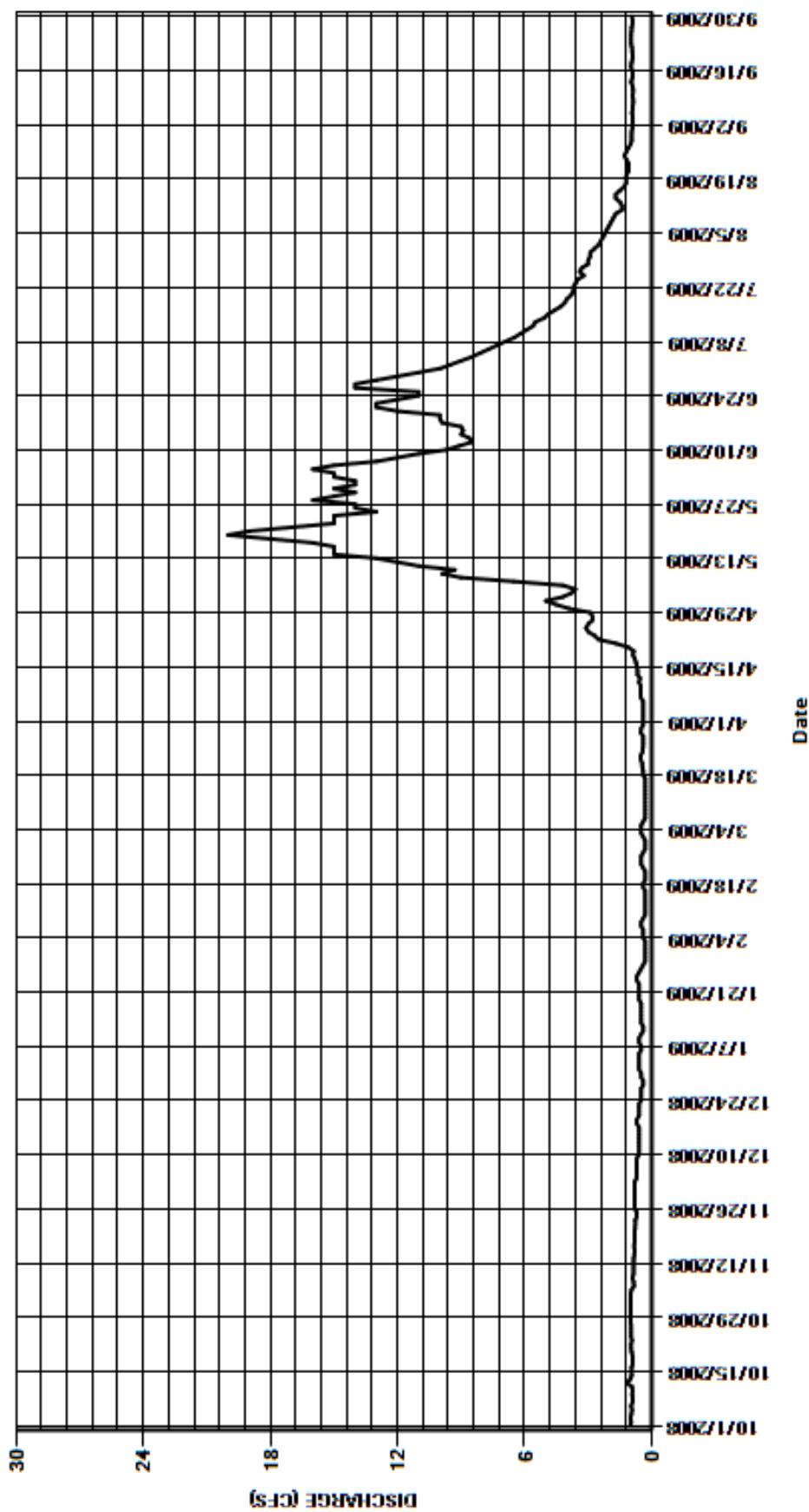
CAL YR	2008	TOTAL	775.82	MEAN	2.12	MAX	12	MIN	0.4	AC-FT	1540
WTR YR	2009	TOTAL	1123.02	MEAN	3.08	MAX	20	MIN	0.3	AC-FT	2230

MAX DISCH: 24 CFS AT 21:00 ON May. 19,2009 GH 2.53 FT. SHIFT 0 FT.

MAX GH: 2.53 FT. AT 21:00 ON May. 19,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILD CHERRY CREEK NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
RITO ALTO CREEK NEAR CRESTONE
Water Year 2009

Location.-- Lat. $38^{\circ}04'39''$, Long. $105^{\circ}45'43''$, UTM X 433123.0, Y 4214688.1, in SW1/4NE1/4 Sec. 9, T.44 N., R.11 E., NMPM, Saguache Co., on right bank of channel approximately 300 feet East of parking area, 12 miles SE of Mineral Hot Springs, 7 miles NW of Crestone.

Drainage and Period of Record.-- 10.3 mi².

Equipment.-- Graphic water stage recorder, data collection platform (SatLink Data Logger with HDR GOES radio), and a float-operated shaft encoder in a 4 ft. diameter culvert pipe shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 26, 2008 to March 19, 2009, when station was closed for the winter and August 5 – 21, 2009 when the gage was isolated. Stage-discharge relation was affected by ice Nov. 15, 22-25, 2008, and March 26-31, April 2, 5–7, 2009.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on September 4, 2009 using B.M. No. 1 as base. The RP elevation was within allowable limits, so a correction was not made or required. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Station is at a site with rock and cobble channel. Large boulders 6 to 10 feet below gage are the control. Steep banks are a part of the control at higher flows. Minor shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating No. 4, in use since Oct. 1, 2005, was used again this year. It is fairly well defined from about 2.6 to 103 cfs. Nineteen discharge measurements (Nos. 147-165) were made during the water year ranging in discharge from 2.08 cfs to 59.8 cfs. They cover the discharge range experienced except for the lower daily flows on Dec. 10-12, 14, 15, 27, 28, 2008, Jan. 7-13, 28, Mar. 31, April 2-7, 2009, and the higher daily flows May 18-24, June 20-30, 2009. The peak flow of 175 cfs occurred at 23:00 on June 26, 2009 at a gage-height of 3.22 feet with a shift of 0.01 feet. It exceeded high measurement No. 159 (GH = 2.61), made June 23, 2009 by 0.61 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. A shift curve was used to apply shifts according to stage during the period from March 19 to June 26, 2009. During other periods, shifts were applied as defined by measurements and distributed by time. All measurements were given full weight except Nos. 155-157, and 163 which were adjusted as much as 7% to smooth shift distribution. Measurement No. 147 was not used for record development due to recognized meter problems. A check measurement, No. 148, was made and used. Measurements show shifts varied from -0.10 to +0.01 feet prior to the control collapsing due to high flow on June 26, 2009. Shifts varied from 0.21 to 0.33 ft during the time the control was collapsed, June 26 to August 21, 2009. Measured shifts varied from -0.07 to -0.11 ft after the control was repaired.

Special Computations.-- Discharge for winter no gage-height and ice affected record was estimated using five discharge measurements and weather records. Discharge for the period when the gage was isolated, August 5-21, 2009, was estimated using two measurements. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height and ice affected record, which are poor. Logs were found on and removed from the control on two visits, Oct. 27, 2008 and May 6, 2009. Due to the large gage height change caused by these logs and the uncertainty of when the logs became lodged on the control the period of record from October 13-27, 2008, and May 1-6, 2009 should be considered fair. The period from June 25-July 6, 2009 is considered poor due to erosion of the control during a high water event and the fact that shift for the period was based on a single measurement at the end of the period. The peak flow was during this period and is also considered poor due to the shift uncertainty and necessary extrapolation of the rating curve. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RITO ALTO CREEK NEAR CRESTONE

RATING TABLE--

RITCRECO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

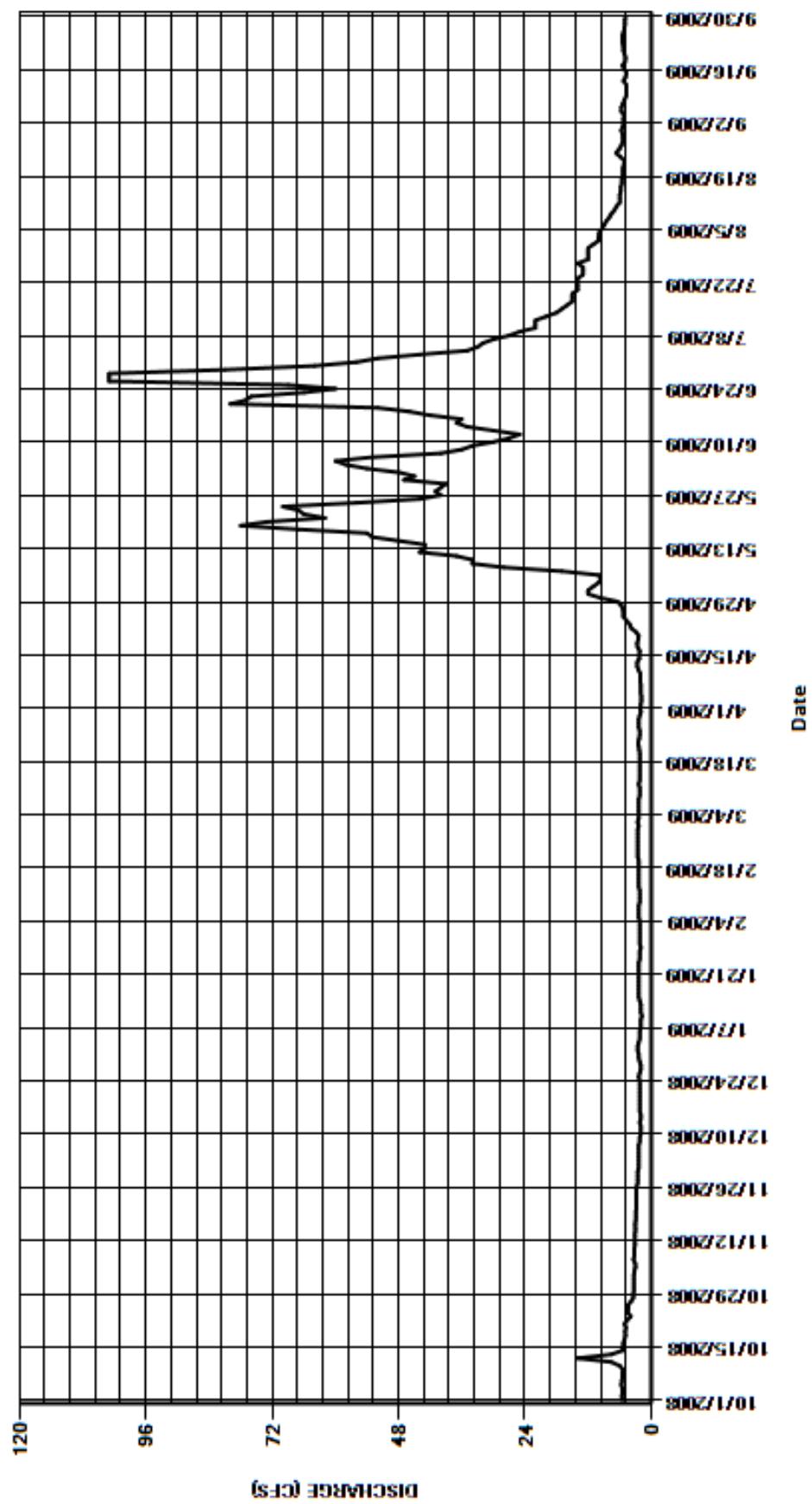
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.5	3.3	2.4	2.6	2.2	2.4	2.1	12	45	56	11	5.4
2	5.6	3.3	2.4	2.6	2.2	2.6	2	12	48	52	10	5.3
3	5.5	3.3	2.4	2.4	2.2	2.4	1.9	11	54	44	10	5.3
4	5.5	3.2	2.4	2.2	2.2	2.4	1.9	10	58	35	9.9	5.2
5	5.7	3	2.4	2.2	2.4	2.4	2	9.6	60	33	9.4	5.7
6	5.6	3.1	2.4	2.2	2.4	2.4	2	10	53	32	9	5.7
7	5.5	3.4	2.4	2	2.4	2.4	2	17	40	30	8.6	5.4
8	5.5	3.2	2.2	2	2.4	2.4	2.1	28	36	27	8	5.1
9	5.4	3.2	2.2	2	2.2	2.2	2.1	34	34	25	7.6	4.8
10	6	3.2	2	1.8	2.2	2.2	2.1	34	30	22	7	4.7
11	7.6	3.1	2	2	2.2	2.2	2.4	37	27	22	6.6	4.7
12	14	3.1	2	2	2.2	2.4	2.7	44	25	22	6	4.8
13	7.6	3.1	2.2	2	2.4	2.2	2.7	43	30	20	6	5.3
14	5.5	3.1	2	2.2	2.4	2.2	2.3	43	35	18	6	4.9
15	5.4	3	2	2.4	2.4	2.2	2.3	48	37	17	5.8	4.7
16	5.3	3.1	2.2	2.4	2.4	2.2	2.2	53	36	16	5.8	5.1
17	5.1	3	2.2	2.4	2.4	2.2	2.6	54	42	15	5.6	5.5
18	4.9	2.9	2.2	2.4	2.4	2.2	2.7	67	46	15	5.6	5
19	5	2.9	2.2	2.4	2.4	2.2	2.5	78	52	15	5.4	4.9
20	4.8	2.9	2.2	2.4	2.4	2.2	2.4	73	80	14	5.4	5.1
21	5.1	2.8	2.2	2.4	2.6	2.3	2.9	62	77	14	5.4	5.3
22	4.6	2.8	2.2	2.4	2.6	2.4	3.8	66	76	14	5.2	5.3
23	3.9	2.8	2.2	2.4	2.6	2.5	4.1	67	66	14	5.1	5.5
24	4.5	2.8	2.2	2.4	2.6	2.3	4.7	70	60	13	5.9	5.5
25	4.4	2.8	2.4	2.2	2.6	2.2	5.3	56	69	13	6.7	5.5
26	4.4	2.8	2.2	2.2	2.6	2.2	5.3	44	103	13	6.1	5.2
27	3.8	2.6	2	2.2	2.6	2.4	5.4	40	103	14	5.7	5.1
28	3.4	2.6	2	2	2.6	2.4	5.7	41	103	12	5.4	5
29	3.4	2.6	2.2	2.2	---	2.4	6.4	40	81	12	5.4	5
30	3.3	2.6	2.4	2.2	---	2.2	9.7	39	64	12	5.5	4.9
31	3.3	---	2.4	2.2	---	2	---	47	---	12	5.7	---
TOTAL	165.1	89.6	68.8	69.4	67.2	71.3	98.3	1289.6	1670	673	210.8	154.9
MEAN	5.33	2.99	2.22	2.24	2.4	2.3	3.28	41.6	55.7	21.7	6.8	5.16
AC-FT	327	178	136	138	133	141	195	2560	3310	1330	418	307
MAX	14	3.4	2.4	2.6	2.6	2.6	9.7	78	103	56	11	5.7
MIN	3.3	2.6	2	1.8	2.2	2	1.9	9.6	25	12	5.1	4.7
CAL YR	2008	TOTAL	3665.6	MEAN	10	MAX	58	MIN	2	AC-FT	7270	
WTR YR	2009	TOTAL	4628.0	MEAN	12.7	MAX	103	MIN	1.8	AC-FT	9180	

MAX DISCH: 175 CFS AT 23:00 ON Jun. 26,2009 GH 3.22 FT. SHIFT 0.01 FT.

MAX GH: 3.22 FT. AT 23:00 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RITO ALTO CREEK NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
SAN ISABEL CREEK NEAR CRESTONE

Water Year 2009

Location.-- Lat. 38°02'04", Long. 105°43'03", UTM X 436984.9, Y 4209879.0, in NE1/4,NW1/4, sec. 25 T.44 N., R.11 E., NMPM, Saguache Co., on left bank of channel approximately 200 feet NW of trail, 3 miles NW of Crestone.

Drainage and Period of Record.-- 5.7 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 4-foot diameter culvert shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 9-21, 2008 and Mar. 27 – Apr. 4, 2009 when well was frozen; Dec. 22, 2008 - Mar. 19, 2009 when station was closed for winter. Stage-discharge relation was affected by ice Nov. 6, 7, 25, 26, Dec. 5, 2008, Apr. 5, 6, 12, 17, 2009. There were no instrument corrections made to the shaft encoder. There was a -0.01 ft. trash correction due to cleaning debris from control on May 14, 2009.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Aug. 5, 2008 to the Reference Point (RP) inside the gage using BM #1 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control is a boulder/cobble weir at low and medium flows, with some bank effect at higher flows. Stream bottom is mostly rounded rocks, cobbles, and gravel. The stage-discharge relation can be affected by persons moving rocks and piling logs on control. Rating No. 3 was used again this year. It is fairly well defined from 3 to 50 cfs. Seventeen discharge measurements (Nos. 152-168) were made this year, ranging in discharge from 1.13 to 28.8 cfs. They cover the discharge range experienced, except for the higher daily flows on May 9, 17-20, 23-25, 27, 28, 31, Jun. 2-6, 26, 27, 2009. The peak flow of 60.7 cfs occurred at 00:00 on June 27, 2009 at a gage-height of 4.53 ft with a shift of -0.01 ft. It exceeded high measurement No. 162 (GH = 4.27), made May 28, 2009, by 0.26 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Open water measurements show shifts varied from -0.03 to +0.02 ft. All were given full weight except for Nos. 153, 154, 158, 160, 164, 166, and 167, which were adjusted by as much as 6% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using four discharge measurements and weather records. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SAN ISABEL CREEK NEAR CRESTONE

RATING TABLE--

SANCRECO03 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	2.6	2.1	1.8	1.5	2	2	13	28	18	4.7	2.7
2	2.9	2.6	2	1.8	1.6	2.2	2	15	31	17	4.4	2.6
3	2.9	2.6	2.1	1.8	1.6	2.4	2.2	12	37	16	4.3	2.6
4	2.9	2.6	2	1.7	1.6	2.6	2.2	10	36	14	4.1	2.6
5	2.9	2.5	2	1.6	1.7	2.6	2	10	35	14	3.9	2.9
6	2.9	2.4	2.1	1.4	1.8	2.6	2	12	30	13	3.9	2.8
7	2.8	2.4	2	1.4	2	2.4	2	19	23	12	3.8	2.7
8	2.8	2.4	2.1	1.6	2.2	2.2	2.2	29	21	11	3.6	2.6
9	2.8	2.3	2	1.6	2	2.2	2.4	30	19	11	3.4	2.6
10	2.7	2.3	1.9	1.4	1.8	2.2	2.5	25	17	9.9	3.4	2.6
11	3	2.3	1.8	1.4	1.6	2.2	2.8	26	15	9.8	3.3	2.5
12	3.1	2.3	1.8	1.4	1.6	2.2	2.6	29	15	9.5	3.2	2.6
13	2.8	2.3	1.9	1.6	1.6	2.2	2.9	26	16	8.9	3.1	3
14	2.9	2.2	1.8	1.6	1.6	2.2	2.8	25	17	8.4	3.8	2.5
15	2.9	2.2	1.6	1.6	1.6	2.2	2.7	25	18	7.8	3.6	2.4
16	2.8	2.2	1.6	1.6	1.8	2.2	2.8	28	17	7.3	3.3	2.6
17	2.8	2.2	1.6	1.6	1.8	2.4	2.9	30	18	6.8	3.1	2.8
18	2.7	2.2	1.8	1.6	1.8	2.6	3.1	35	18	6.5	3	2.7
19	2.7	2.2	2	1.8	1.6	2.7	3	37	19	6.4	2.9	2.6
20	2.7	2.1	1.9	1.8	1.6	2.9	3.6	33	26	6.2	2.8	2.6
21	2.7	2.1	1.8	1.8	1.8	3.1	5.2	27	26	5.9	2.7	2.6
22	2.6	2	1.8	1.8	2	3.4	7.5	29	24	6	2.7	2.6
23	2.5	2	1.8	2	2.2	3.4	8.6	34	22	5.8	2.6	2.7
24	2.7	1.9	1.8	2	2.4	2.8	9.9	38	19	5.4	3.3	2.7
25	2.7	1.9	1.8	2	2.4	2.6	10	32	21	5.2	3.4	2.7
26	2.7	1.9	1.8	1.8	2.4	2.3	9.6	29	32	5.5	3	2.6
27	2.7	2	1.6	1.6	2.2	2.2	9	30	37	5.4	2.9	2.5
28	2.7	2.1	1.4	1.4	2	2	8.9	31	26	5.1	2.7	2.5
29	2.6	2.2	1.4	1.4	---	2	9.3	29	22	5	2.7	2.4
30	2.6	2.1	1.6	1.4	---	2	11	28	19	5	2.7	2.4
31	2.6	---	1.6	1.5	---	2	---	30	---	4.9	2.8	---
TOTAL	86.0	67.1	56.5	50.8	51.8	75.0	139.7	806	704	272.7	103.1	78.7
MEAN	2.77	2.24	1.82	1.64	1.85	2.42	4.66	26	23.5	8.8	3.33	2.62
AC-FT	171	133	112	101	103	149	277	1600	1400	541	204	156
MAX	3.1	2.6	2.1	2	2.4	3.4	11	38	37	18	4.7	3
MIN	2.5	1.9	1.4	1.4	1.5	2	2	10	15	4.9	2.6	2.4

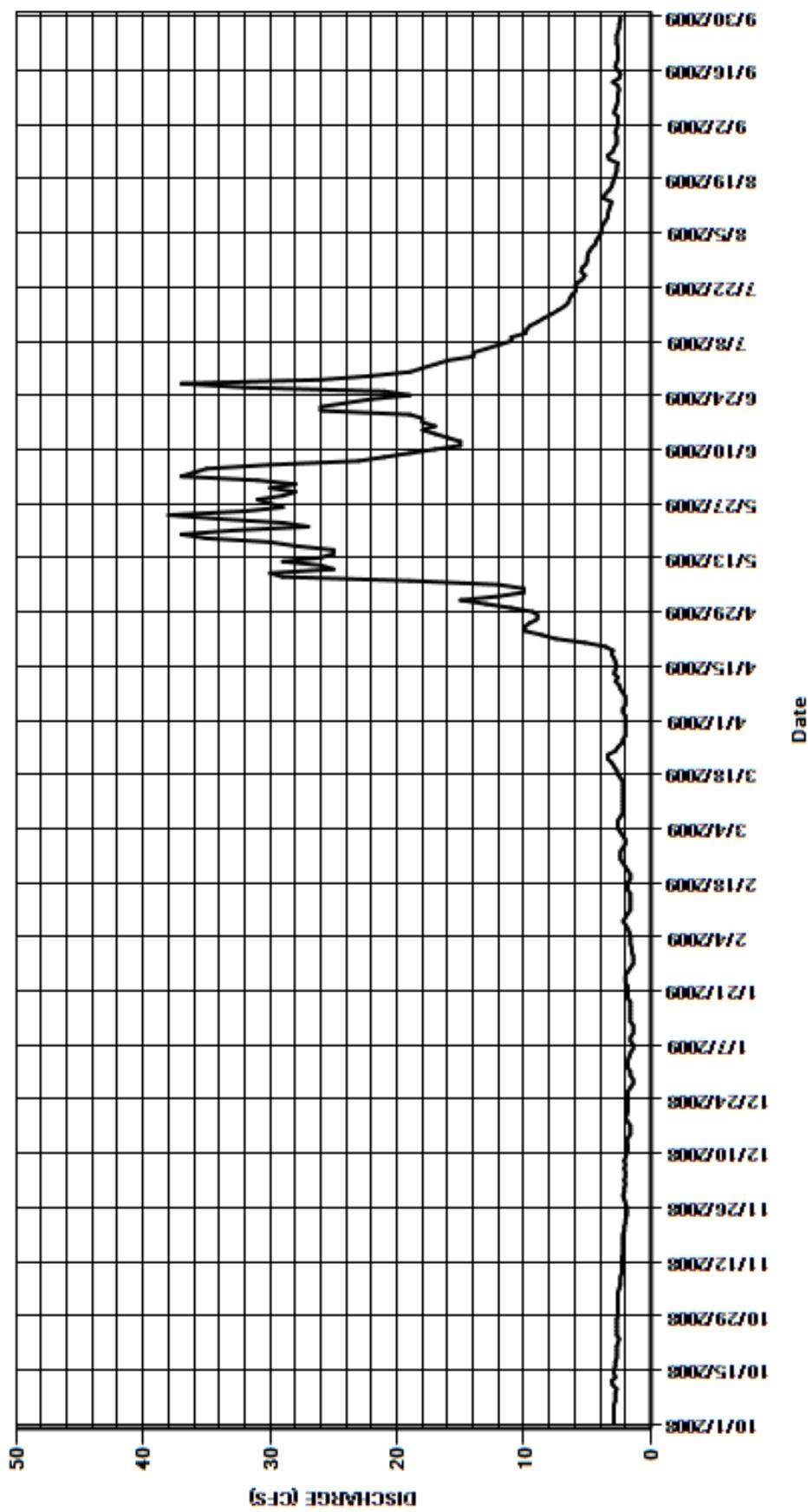
CAL YR	2008	TOTAL	1813.0	MEAN	4.95	MAX	25	MIN	1.4	AC-FT	3600
WTR YR	2009	TOTAL	2491.4	MEAN	6.83	MAX	38	MIN	1.4	AC-FT	4940

MAX DISCH: 61 CFS AT 00:00 ON Jun. 27,2009 GH 4.53 FT. SHIFT -0.01 FT.

MAX GH: 4.53 FT. AT 00:00 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SAN ISABEL CREEK NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08227000 SAGUACHE CREEK NEAR SAGUACHE
Water Year 2009

Location.-- Lat. 38°09'48", Long. 106°17'24", UTM X 386939.7, Y 4224724.1, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T. 45 N., R 6 E., Saguache County, Hydrologic Unit 13010004, on left bank 0.2 Mi downstream from Middle Creek and 10 mi northwest of Saguache.

Drainage and Period of Record.-- 595 mi². Aug. 1910-Sept. 1912, Jun. 1914 to current year. Monthly discharge only for some periods. Water-quality data available, Apr. 1993-Sep. 1995.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, a tipping-bucket rain gauge, and air temperature sensor in a CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Bank-operated cableway located 10 feet below gaging station. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. The stage-discharge relation was affected by ice Nov. 21, 22, 24, 25, and Dec. 5, 2008 through Mar. 8, 2009, and Mar. 10, 2009. There was one +0.01 foot instrumentation correction made to the shaft encoder. This correction was prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 5, 2009 using R.M. No. 2 as base. The RP was within allowable limits, so no corrections were required or made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Channel and gravel bar downstream are the low water controls. A bend in the channel approximately 100 feet downstream is the high water control. Scour, fill, and moss growth cause shifting. Rating No. 16 in use since Oct. 1, 1999 was used again this year. It is well defined from 10 to 500 cfs, but it is considered only fair outside that range. Fifteen measurements (Nos. 165-179) were made this year ranging in discharge from 24.6 to 205 cfs. They cover the range experienced except for the lower daily flows of Oct. 23, Nov. 6, 7, 15, 16, 20-26, Dec. 4-6, 11-16, 27-31, 2008, Jan. 1, 18-21, 27-30, Feb. 14-16, Mar. 27, 28, 31, Apr. 2, 5, 6, 2009; and higher daily flows of May 22-25, 27, 2009. The peak flow of 269 cfs occurred at 04:45 on May 23, 2009 at a gage-height of 2.88 feet with a shift of +0.06 feet. It exceeded high measurement No. 173 (GH=2.56), made May 12, 2009 by 0.32 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. A variable shift curve (SAGASAGV0901) was used from Apr. 24 through Aug. 5, 2009 to distribute shifts according to stage. During other periods, shifts were applied as defined by measurements, and were distributed by time. Measurements show shifts varied between -0.01 and +0.06 ft. All open water measurements were given full weight except for Nos. 165, 172, 174, 176, and 177 which were adjusted as much as 4 percent to smooth shift distribution.

Special Computations.-- Discharge for periods of ice affected record was estimated on the basis of four measurements, weather records, partial record days, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good except for periods of ice-affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08227000 SAGUACHE CREEK NEAR SAGUACHE

RATING TABLE--

SAGSAGCO16 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

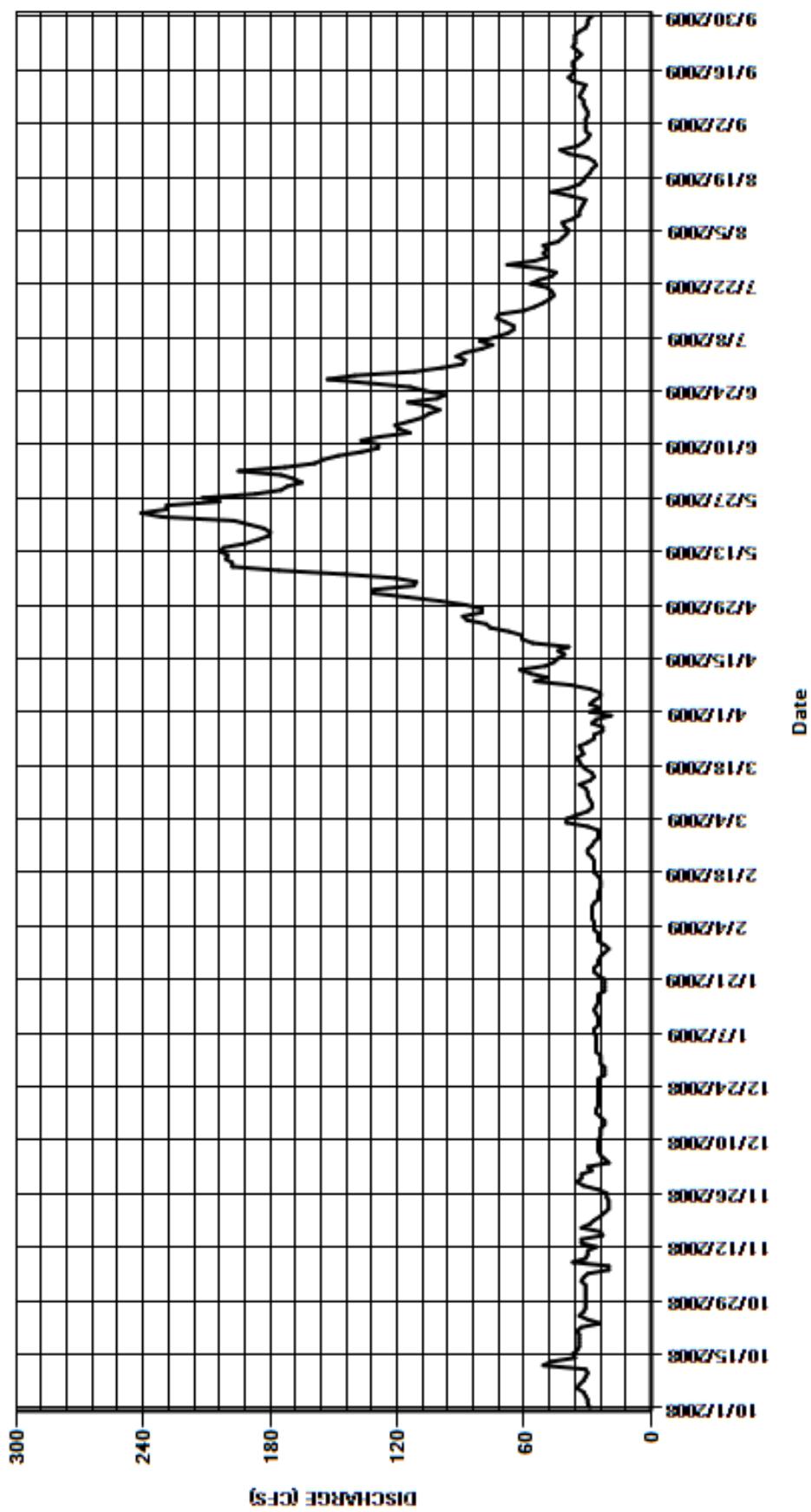
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	31	33	24	25	25	29	115	169	89	51	31
2	30	31	28	26	25	30	24	131	175	88	44	31
3	30	33	30	26	27	40	29	131	195	92	42	31
4	31	32	20	26	27	40	27	112	173	88	40	30
5	32	30	22	26	27	35	24	111	159	80	39	30
6	35	20	24	26	28	30	24	121	155	75	41	31
7	34	20	25	27	28	28	29	145	148	81	42	32
8	32	37	25	27	28	28	38	176	137	74	37	32
9	31	31	25	25	28	29	55	198	129	68	34	34
10	30	30	25	25	27	30	49	198	129	65	34	33
11	31	30	24	25	25	30	57	201	137	65	33	32
12	51	26	24	26	25	31	62	200	128	69	32	31
13	47	33	24	27	25	34	50	204	114	73	31	37
14	36	33	22	26	24	29	46	202	119	72	38	39
15	37	23	22	25	24	27	44	192	121	60	47	37
16	35	24	24	25	24	28	41	186	114	55	39	36
17	34	33	26	25	25	31	44	181	108	51	34	37
18	34	29	26	22	27	33	39	180	105	48	32	37
19	34	27	25	22	27	34	56	183	100	46	31	35
20	34	24	25	22	27	35	61	190	105	47	29	33
21	35	22	25	22	27	32	61	197	115	49	28	35
22	33	20	25	25	28	33	67	231	101	57	26	37
23	24	20	25	27	30	34	76	241	97	53	27	36
24	30	20	25	27	30	30	78	229	107	47	30	36
25	34	21	25	25	28	27	87	229	114	45	39	36
26	32	21	25	25	27	27	89	204	133	52	43	34
27	31	25	22	24	25	23	80	212	153	68	35	31
28	31	32	22	22	25	23	80	187	140	55	32	30
29	31	35	22	20	---	28	88	175	112	49	30	30
30	31	33	24	22	---	26	100	172	99	51	29	28
31	31	---	24	25	---	19	---	165	---	49	31	---
TOTAL	1030	826	763	767	743	929	1634	5599	3891	1961	1100	1002
MEAN	33.2	27.5	24.6	24.7	26.5	30	54.5	181	130	63.3	35.5	33.4
AC-FT	2040	1640	1510	1520	1470	1840	3240	11110	7720	3890	2180	1990
MAX	51	37	33	27	30	40	100	241	195	92	51	39
MIN	24	20	20	20	24	19	24	111	97	45	26	28
CAL YR	2008	TOTAL	21612	MEAN	59	MAX	267	MIN	20	AC-FT	42870	
WTR YR	2009	TOTAL	20245	MEAN	55.5	MAX	241	MIN	19	AC-FT	40160	

MAX DISCH: 269 CFS AT 04:45 ON May. 23,2009 GH 2.88 FT. SHIFT 0.06 FT.

MAX GH: 2.88 FT. AT 04:45 ON May. 23,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08227000 SAGUACHE CREEK NEAR SAGUACHE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08227500 CRESTONE CREEK, NORTH NEAR CRESTONE
Water Year 2009

Location.-- Lat. 38°00'49", Long. 105°41'32", UTM X 439185.9, Y 4207551.5, Saguache County, Hydrologic Unit 13010003, on right bank in canyon, 1.5 mi. northeast of Crestone, and 3.2 mi. upstream from South Crestone Creek.

Drainage and Period of Record.-- 10.7 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 36 inch corrugated metal shelter and 36 inch concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 24, 2008 through Mar. 20, 2009 when the station was closed for the winter; and Nov. 7-23, 2008, Mar. 24-31, Apr. 1, 2, 6, 2009 when floats were affected by ice in well. Stage-discharge relationship was affected by ice (b-days) April 5, 7, 2009. There were no instrument corrections made to the shaft encoder.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Aug. 5, 2008 to the Reference Point (RP) inside the gage using BM #7 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control is a concrete ramp flume approximately 4 feet below the gage. Shifting occurs mainly due to the movement of streambed materials in and above gage pool. Rating No. 11 was used again this year. This rating, previously named No. 11TMP, has been in use since Apr. 27, 2005. It is well defined from 2 to 95 cfs. Seventeen measurements (Nos. 180-196) were made this year ranging in discharge from 0.76 to 59.3 cfs. They cover the discharge range experienced except for the higher daily flows on May 18-20, 23-26, 28, June 3-5, 26, 27, 2009. The peak flow of 91.3 cfs occurred at 00:30 on June 27, 2009 at a gage-height of 1.89 feet with a shift of -0.01 feet. It exceeded high measurement No. 190 (GH = 1.63), made May 26, 2009 by 0.26 feet in stage.

Discharge.-- Shifting control method was used for all open water periods. Shifts were applied as defined by measurements and were distributed by time. Open water measurements show shifts varied between -0.02 and +0.02 ft. All open water measurements were given full weight and applied except No. 196 which was adjusted by 4% to smooth shift distribution and No. 191 which was not used due to a non-standard velocity profile.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five measurements, comparison with nearby stations, and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08227500 CRESTONE CREEK, NORTH NEAR CRESTONE

RATING TABLE--

NOCRESCO11 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.5	2.8	1.8	2	1.5	1.7	2	21	55	34	6.6	2.7
2	4.5	2.8	2	2	1.5	2	2	22	59	33	6	2.6
3	4.3	2.9	2	2.2	1.4	2	2.1	19	71	31	5.7	2.6
4	4.3	2.8	2	2	1.4	2.1	2.1	18	71	29	5.4	2.5
5	4.3	2.6	2	1.8	1.6	2.1	1.9	18	70	27	5.1	3.3
6	4.2	2.7	2	1.6	1.6	2.1	2.1	23	58	25	5	3.5
7	4.1	2.2	2	1.4	1.8	2	2.1	38	45	23	4.8	3
8	3.9	2	2	1.4	2	1.9	2.6	52	40	21	4.3	2.9
9	3.8	2.2	1.8	1.4	2	1.7	2.9	52	36	20	4	2.9
10	3.7	2.2	1.6	1.2	1.9	1.5	3.2	42	32	19	3.9	3
11	3.9	2.2	1.6	1.2	1.7	1.5	3.6	46	30	18	3.7	2.8
12	4.2	2.2	1.6	1.2	1.7	1.7	3.1	49	28	17	3.6	2.9
13	3.5	2.4	1.8	1.4	1.6	2	4.3	45	31	16	3.4	3.9
14	3.7	2.4	1.8	1.4	1.5	2	3.8	45	34	15	4.4	3.3
15	3.7	2.2	1.6	1.4	1.5	2	3.7	48	35	14	4.3	3.1
16	3.6	2.2	1.6	1.4	1.5	2.1	3.7	49	33	13	3.7	3.8
17	3.4	2.2	1.8	1.4	1.5	2.1	3.9	53	35	12	3.3	4.2
18	3.4	2.4	2	1.4	1.4	2.5	4.6	63	35	11	3.2	4.2
19	3.4	2.4	2	1.4	1.3	2.5	4.2	70	36	11	3.1	4
20	3.3	2.2	1.8	1.5	1.3	2.8	4.7	62	46	10	2.9	3.9
21	3.4	2	1.8	1.6	1.2	3.4	6.9	51	48	9.9	2.8	3.7
22	3.3	1.8	1.8	1.6	1.3	3.8	10	51	46	9.8	2.7	3.6
23	2.9	1.8	1.8	1.8	1.4	3.9	12	62	42	9.2	2.7	3.7
24	3.2	1.8	1.8	1.8	1.5	2.5	14	78	36	8.6	3.6	3.7
25	3.1	1.8	1.8	1.6	1.5	2.4	14	70	42	8.1	4	3.7
26	3.1	1.8	1.8	1.5	1.4	2.3	13	60	65	8.2	3.3	3.6
27	3	1.8	1.6	1.5	1.4	2.2	12	59	75	8.1	3.1	3.5
28	3	1.8	1.6	1.5	1.6	2.2	12	61	55	7.7	2.8	3.3
29	3	1.8	1.6	1.4	---	2	13	58	44	7.3	2.8	3.1
30	3	1.8	1.8	1.4	---	2	18	53	38	7.1	2.8	3
31	2.9	---	2	1.5	---	2	---	59	---	7	2.8	---
TOTAL	111.6	66.2	56.2	47.9	43.0	69.0	187.5	1497	1371	490.0	119.8	100.0
MEAN	3.6	2.21	1.81	1.55	1.54	2.23	6.25	48.3	45.7	15.8	3.86	3.33
AC-FT	221	131	111	95	85	137	372	2970	2720	972	238	198
MAX	4.5	2.9	2	2.2	2	3.9	18	78	75	34	6.6	4.2
MIN	2.9	1.8	1.6	1.2	1.2	1.5	1.9	18	28	7	2.7	2.5

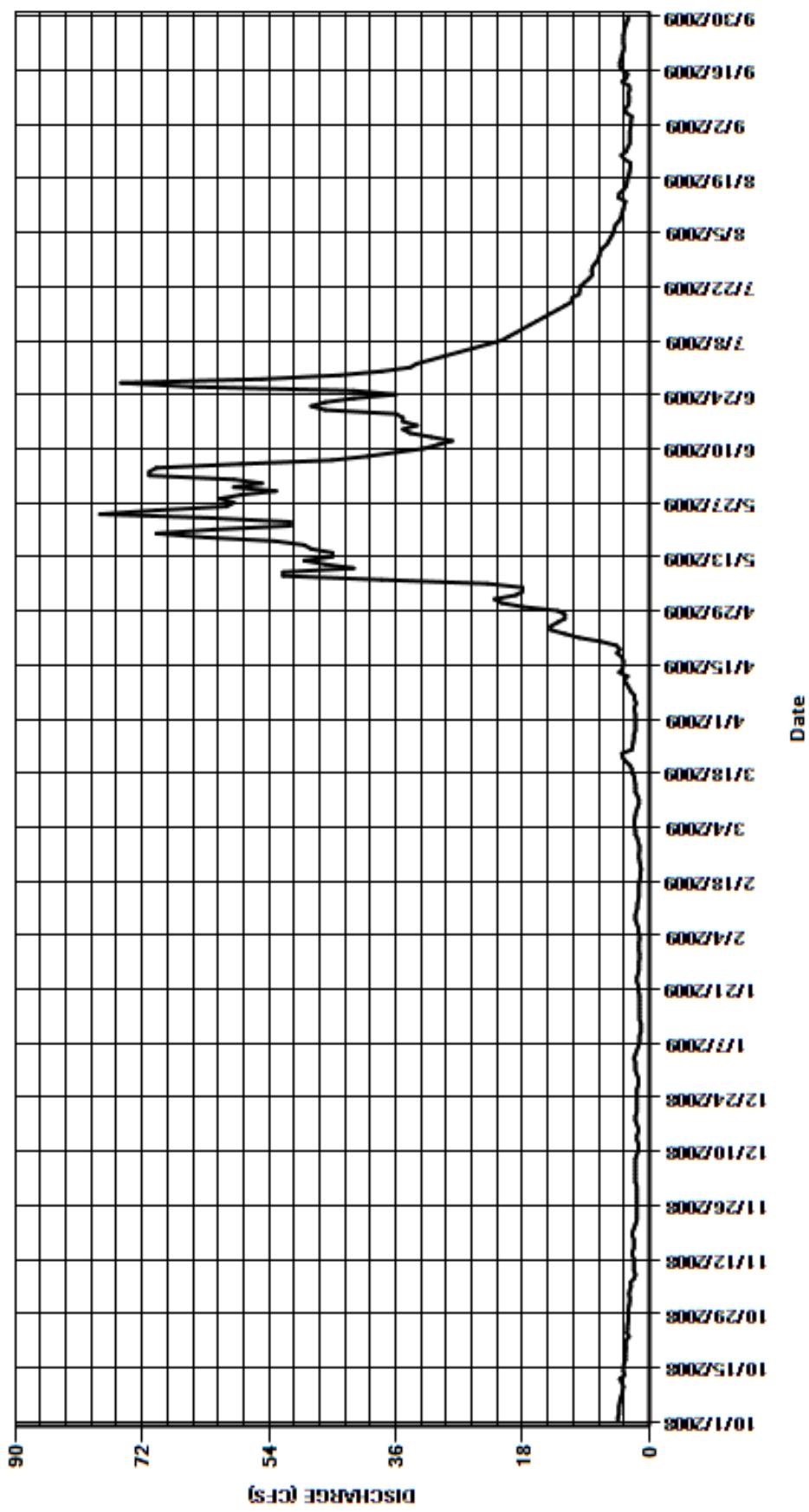
CAL YR	2008	TOTAL	3559.4	MEAN	9.73	MAX	66	MIN	1.4	AC-FT	7060
WTR YR	2009	TOTAL	4159.2	MEAN	11.4	MAX	78	MIN	1.2	AC-FT	8250

MAX DISCH: 91 CFS AT 00:30 ON Jun. 27,2009 GH 1.89 FT. SHIFT -0.01 FT.

MAX GH: 1.89 FT. AT 00:30 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08227500 CRESTONE CREEK, NORTH NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CRESTONE CREEK NEAR CRESTONE
Water Year 2009

Location.-- Lat. 37°58'55", Long. 105°42'41", UTM X 437475.8, Y 4204050.9, in NE1/4SW1/4 Sec. 12, T.43 N., R.11 E., NMPM, Saguache Co., on right bank, 1 mile SE of Crestone.

Drainage and Period of Record.-- 4.6 mi².

Equipment.-- Data collection platform (Sutron Model SatLink Logger with HDR GOES radio), and a float-operated shaft encoder in small steel shelter on top of a 2 ft. diameter corrugated culvert pipe stilling well. A 1-inch intake pipe attaches well to a 2.5 foot Parshall flume at the REW. The primary reference gage is a staff gage also located at REW. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log as backup. Record is complete and reliable except for Oct. 22, 23, Nov. 4-7, 12, 14, 15, 18-23, 2008, Mar. 21-31, Apr. 1-13, 17, Aug. 22-24, 30, 31, and Sep. 1-5 2009 when the well isolated from flume and Nov. 24, 2008 through March 20, 2009 when the station was closed for the winter. Opening of gage was attempted on Mar. 20, 2009, but the well was isolated from flume due to extremely low flows. Stage-discharge relation was affected by ice Nov. 8 and 16, 2008. There were two instrumentation corrections made to the shaft encoder -0.01 and +0.01 feet. These corrections were prorated by time from previous visit.

Datum Corrections.-- Parshall flume inspection was completed on the flume last year on Aug. 5, 2008. Levels indicate that the lateral slope of the flume floor at the staff gage is approximately 0.4% from REW, but is slightly concave with the middle being about 0.04 feet lower than at staff. Laterally, at the throat section, the flume is level. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- Control is a 2.5 foot Parshall flume in good condition. The flume and well ice up during winter, and sediment deposit in and above flume can cause minor shifting. The well isolates from flume at a gage-height of 0.04 to 0.06 feet. Rating No. 1, a standard 2.5 foot Parshall flume rating, was used all year. Eighteen measurements (Nos. 151-168) were made this year ranging in discharge from 0 to 11.3 cfs. They cover the discharge range experienced except for higher daily flows on May 24, Jun. 26, 27, 2009. The peak flow of 16 cfs occurred at 03:45 on June 27, 2009 at a gage-height of 1.35 feet with a shift of 0.00 feet. It exceeded high measurement No. 163 (GH = 1.08 ft.) by 0.27 feet in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and distributed mostly by time. Open water measurements show shifts varied from -0.03 to +0.02 ft. All were given full weight except for No. 160, 161, 162, and 165 which were adjusted by as much as 4% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five measurements, comparison with nearby stations, and weather records. A hydrograph was used for winter estimation.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. During the period when the gage was closed, there was no flow from Dec. 28, 2008 through Mar. 14, 2009 (77 days). The timing of flow stopping and starting was estimated. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CRESTONE CREEK NEAR CRESTONE

RATING TABLE--

SOUCRECO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

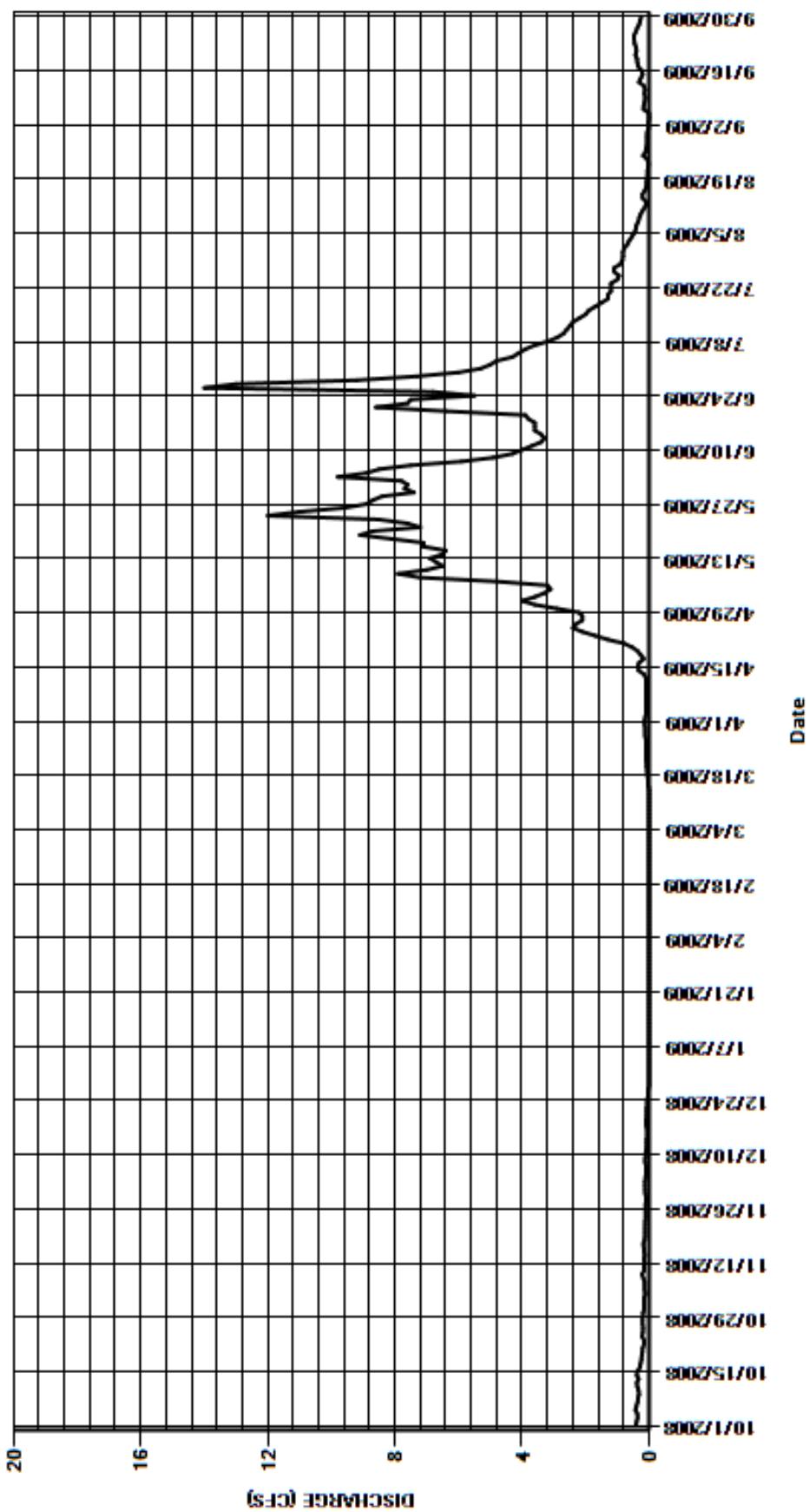
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.42	0.16	0.12	0	0	0	0.14	3.6	7.6	5.3	0.79	0.02
2	0.39	0.16	0.13	0	0	0	0.12	4	7.8	5	0.69	0.02
3	0.36	0.16	0.13	0	0	0	0.09	3.6	9.8	4.8	0.63	0.01
4	0.37	0.12	0.11	0	0	0	0.09	3.3	8.9	4.3	0.55	0
5	0.43	0.14	0.1	0	0	0	0.09	3.1	8.5	4.1	0.47	0.01
6	0.4	0.14	0.1	0	0	0	0.09	3.2	7.5	3.9	0.42	0.18
7	0.36	0.14	0.1	0	0	0	0.09	4.8	5.9	3.6	0.4	0.17
8	0.35	0.18	0.12	0	0	0	0.1	7.2	4.9	3.2	0.34	0.14
9	0.32	0.22	0.12	0	0	0	0.1	7.9	4.3	2.9	0.31	0.12
10	0.33	0.16	0.11	0	0	0	0.1	7	4	2.7	0.26	0.15
11	0.37	0.16	0.1	0	0	0	0.1	6.5	3.7	2.6	0.19	0.13
12	0.39	0.15	0.08	0	0	0	0.1	6.7	3.4	2.5	0.11	0.16
13	0.33	0.16	0.08	0	0	0	0.16	6.9	3.3	2.4	0.09	0.32
14	0.39	0.14	0.08	0	0	0	0.33	6.5	3.4	2.2	0.2	0.26
15	0.37	0.16	0.06	0	0	0.02	0.35	6.4	3.6	2	0.21	0.2
16	0.29	0.17	0.06	0	0	0.04	0.32	7.1	3.6	1.9	0.13	0.24
17	0.27	0.18	0.08	0	0	0.04	0.17	7.1	3.6	1.7	0.09	0.34
18	0.24	0.14	0.1	0	0	0.06	0.26	8.1	3.8	1.5	0.08	0.37
19	0.23	0.13	0.1	0	0	0.06	0.36	9.1	3.9	1.3	0.07	0.38
20	0.21	0.13	0.08	0	0	0.08	0.53	8.7	6.4	1.3	0.05	0.43
21	0.2	0.13	0.08	0	0	0.08	0.79	7.2	8.6	1.2	0.05	0.4
22	0.16	0.12	0.08	0	0	0.1	1.3	7.6	7.6	1.2	0.03	0.41
23	0.16	0.12	0.06	0	0	0.1	1.7	8.5	7.5	1.2	0.02	0.46
24	0.22	0.11	0.06	0	0	0.1	2.1	12	5.5	1	0.05	0.47
25	0.2	0.11	0.04	0	0	0.1	2.4	11	6.8	0.95	0.19	0.48
26	0.19	0.11	0.04	0	0	0.1	2.3	9.6	14	1.1	0.11	0.42
27	0.2	0.11	0.02	0	0	0.1	2.1	8.9	13	1.1	0.09	0.37
28	0.2	0.1	0	0	0	0.12	2.1	8.7	9.2	0.9	0.07	0.31
29	0.2	0.1	0	0	---	0.12	2.2	8.4	7.3	0.84	0.07	0.28
30	0.19	0.12	0	0	---	0.12	2.9	7.4	6	0.82	0.07	0.24
31	0.16	---	0	0	---	0.14	---	7.7	---	0.83	0.06	---
TOTAL	8.90	4.23	2.34	0.00	0.00	1.48	23.58	217.8	193.4	70.34	6.89	7.49
MEAN	0.29	0.14	0.075	0	0	0.048	0.79	7.03	6.45	2.27	0.22	0.25
AC-FT	18	8.4	4.6	0	0	2.9	47	432	384	140	14	15
MAX	0.43	0.22	0.13	0	0	0.14	2.9	12	14	5.3	0.79	0.48
MIN	0.16	0.1	0	0	0	0	0.09	3.1	3.3	0.82	0.02	0
CAL YR	2008	TOTAL	389.03	MEAN	1.06	MAX	6.7	MIN	0	AC-FT	772	
WTR YR	2009	TOTAL	536.45	MEAN	1.47	MAX	14	MIN	0	AC-FT	1060	

MAX DISCH: 16 CFS AT 03:45 ON Jun. 27,2009 GH 1.35 FT. SHIFT 0 FT.

MAX GH: 1.35 FT. AT 03:45 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CRESTONE CREEK NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
WILLOW CREEK NEAR CRESTONE
Water Year 2009

Location.-- Lat. 37°57'29", Long. 105°41'59", UTM X 438481.7, Y 4201392.8, in SE1/4NW1/4 Sec. 20, T.43 N., R.12 E., NMPM, Saguache Co. on right bank, 2 miles SE of Crestone.

Drainage and Period of Record.-- 8.0 mi².

Equipment.-- Data collection platform (Sutron SatLink Logger with HDR GOES radio), and a float-operated SDR in a small steel box shelter on a 2-foot culvert pipe well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with SDR and DCP log as backup. Record is complete and reliable except for Oct. 17 through Nov. 23, 2008 and Jul. 6, 7, 2009 when the well was isolated; Jun. 20, 21, 2009 when satellite data was missing; and Nov. 24, 2008 through Mar. 20, 2009 when the station was closed for the winter. Two instrumentation corrections were made to the shaft encoder during the year. A +0.01 ft. correction was made on May 26, 2009 and a -0.01 ft. correction was made on Jun. 26, 2009. Both corrections were prorated by time from the previous visit.

Datum Corrections.-- Levels were not run this year due to the stability of the elevations to the RP. Levels were last run to the Reference Point (RP) inside the gage on Aug. 5, 2008 using R.M. No. 1 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made.

Rating.-- Control is a weir made of rocks and cobbles. Shifting occurs due to the movement of streambed materials at control and in approach, especially at higher stages. Rating No. 3 was extended and used this year (WILCRECO03-3). Twenty measurements (Nos. 154-173) were made this year ranging in discharge from 0.37 to 49.6 cfs. They cover the discharge range experienced except for higher daily flows on Jun. 26, 27, 2009. The peak flow of 135 cfs occurred at 04:30 on Jun. 27, 2009 at a gage height of 4.07 feet with a shift of +0.05 ft. It exceeded high measurement No. 167 (GH=3.43 ft.) by 0.64 feet in stage.

Discharge.-- Shifting control method was used during all open water periods. Open water measurements show shifts varied from -0.04 to +0.05 ft. before control washed out, from +0.42 to +0.44 ft. after washout, and from 0.00 to +0.05 ft. after rebuilding control. All were given full weight except for Nos. 154, 162, 164, 166 and 171, which were adjusted by as much as 7% to smooth shift distribution. Measurement Nos. 155 and 156 were not used because of the gage being isolated.

Special Computations.-- Discharge for periods of no gage-height was estimated using seven discharge measurements, comparison with nearby stations, and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height, which are poor. The peak discharge should also be considered poor due to necessary straight-line extrapolation of the rating curve. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILLOW CREEK NEAR CRESTONE

RATING TABLE--

WILCRECO03-3 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.1	1.8	1.2	1.1	0.9	1	0.93	4.4	19	23	4.1	1.6
2	2	1.8	1.3	1.2	0.9	1	0.93	5.4	21	22	3.8	1.6
3	2	2	1.3	1.2	1	1.1	0.75	5.1	22	22	3.6	1.4
4	2.1	1.8	1.1	1	1	1.2	0.69	4.5	22	18	3.4	1.4
5	2.2	1.6	1.1	1	1	1.2	0.64	4.1	21	18	3.3	1.5
6	2.2	1.4	1.1	0.9	1.1	1.2	0.73	4	19	16	3.2	1.7
7	2.1	1.5	1.2	1	1.1	1	0.74	6.6	15	12	3.2	1.9
8	2	1.7	1.3	1.1	1.2	0.8	0.74	12	12	10	3	1.9
9	1.9	1.6	1.1	1.1	1.1	0.9	0.69	14	11	9.2	2.7	1.9
10	1.8	1.5	1.1	0.9	1	0.8	0.65	12	10	8.5	2.5	2.1
11	1.9	1.6	1.1	0.8	1	0.8	0.71	9.9	9.6	8.2	2.3	2
12	1.8	1.7	1.2	0.9	0.9	0.7	0.58	12	9	7.9	2.1	2.1
13	1.7	1.8	1.1	0.9	0.9	0.7	0.83	13	9.3	7.3	2	2.4
14	1.7	2	1	0.9	0.9	0.6	0.82	12	11	6.9	2.4	2.4
15	1.8	1.7	0.9	0.9	0.9	0.6	0.87	12	12	6.3	2.6	2.3
16	1.7	1.8	1	0.9	1	0.6	0.98	15	12	5.7	2.4	2.4
17	1.7	2	1	1	1.1	0.7	0.98	16	12	5.2	2.2	2.7
18	1.6	2	1.1	1	1	0.7	1	19	13	4.9	2	2.9
19	1.7	1.8	1	1.1	0.9	0.8	1.1	22	14	4.7	1.9	3
20	1.6	1.6	1	1.1	0.9	0.7	1.3	21	19	4.7	1.8	3
21	1.8	1.6	0.9	0.9	1	0.71	1.6	18	25	4.7	1.7	2.9
22	1.7	1.6	1	0.8	1	0.76	1.9	18	22	4.7	1.7	2.8
23	2	1.6	1	0.9	1.1	0.78	2.3	21	21	4.7	1.7	2.7
24	1.8	1.5	0.9	0.9	1.2	0.78	3.1	28	18	4.5	1.9	2.7
25	1.8	1.4	1	1	1.1	0.86	3.3	23	29	4.2	2.4	2.7
26	1.6	1.4	1	1	1	0.81	3.3	20	66	4.5	2.4	2.4
27	1.4	1.4	0.9	0.9	1	0.74	3.3	19	90	4.9	2.1	2.2
28	1.3	1.4	0.9	0.8	0.9	1	3.2	18	44	4.6	2.1	2
29	1.4	1.2	1	0.8	---	0.9	3.2	19	30	4.5	1.8	1.9
30	1.6	1.2	1	0.9	---	0.75	3.5	17	25	4.2	1.8	1.8
31	1.8	---	1.1	0.9	---	0.88	---	18	---	4.2	1.8	---
TOTAL	55.8	49.0	32.90	29.80	28.10	26.07	45.36	443.0	662.9	270.2	75.9	66.3
MEAN	1.8	1.63	1.06	0.96	1	0.84	1.51	14.3	22.1	8.72	2.45	2.21
AC-FT	111	97	65	59	56	52	90	879	1310	536	151	132
MAX	2.2	2	1.3	1.2	1.2	1.2	3.5	28	90	23	4.1	3
MIN	1.3	1.2	0.9	0.8	0.9	0.6	0.58	4	9	4.2	1.7	1.4

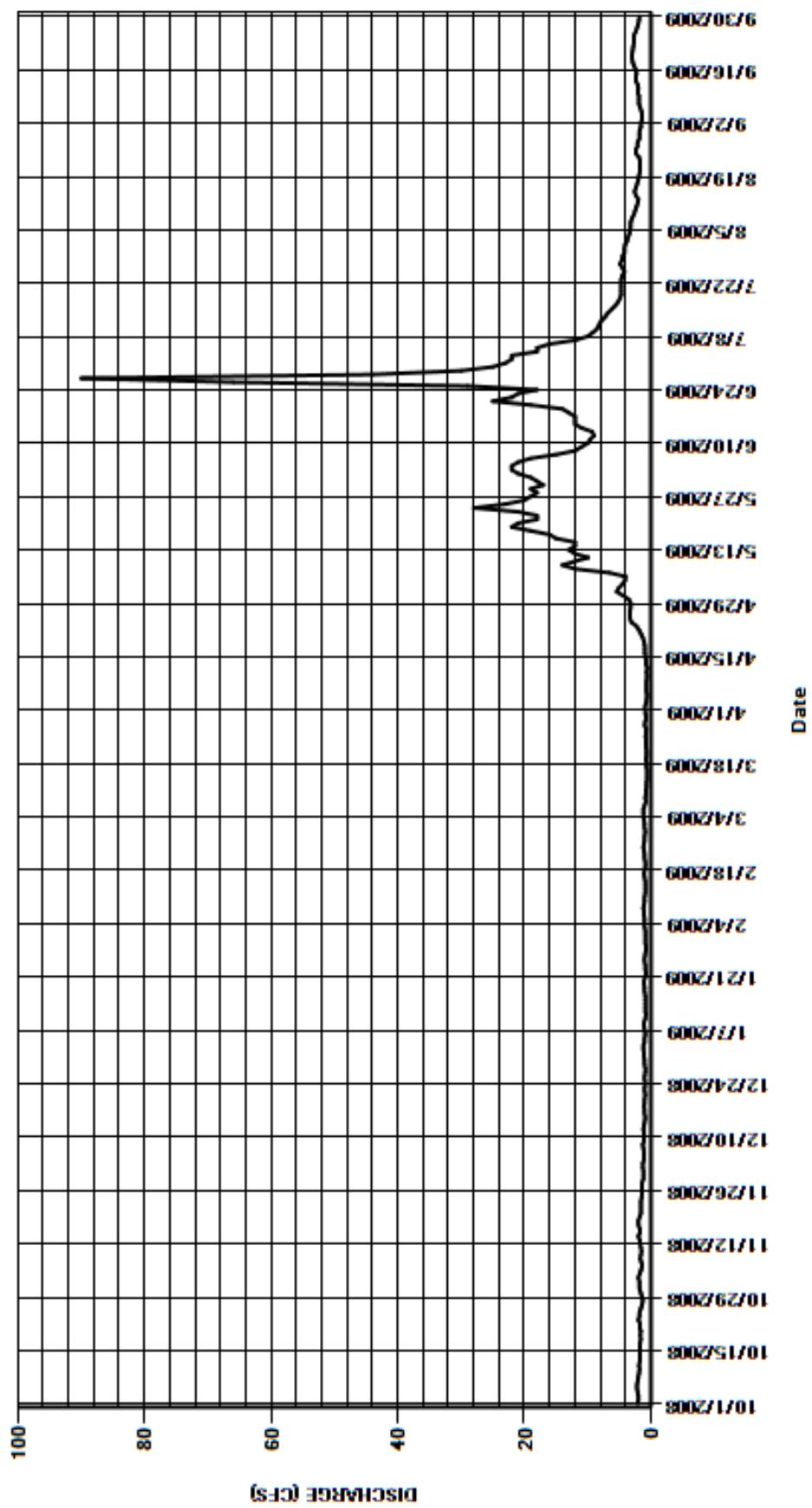
CAL YR	2008	TOTAL	1439.24	MEAN	3.93	MAX	32	MIN	0.6	AC-FT	2850
WTR YR	2009	TOTAL	1785.33	MEAN	4.89	MAX	90	MIN	0.58	AC-FT	3540

MAX DISCH: 135 CFS AT 04:30 ON Jun. 27,2009 GH 4.07 FT. SHIFT 0.05 FT.

MAX GH: 4.07 FT. AT 04:30 ON Jun. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLOW CREEK NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
SPANISH CREEK NEAR CRESTONE
Water Year 2009

Location.-- Lat. 37°57'10", Long. 105°39'42", UTM X 441819.7, Y 4200781.8, in NE1/4SW1/4 Sec. 21, T.43 N., R.12 E., NMPM, Saguache Co., on left bank, 3 1/2 miles SE of Crestone.

Drainage and Period of Record.-- 2.4 mi².

Equipment.-- Data collection platform (Sutron SatLink Logger with HDR GOES radio), and a float-operated SDR in a small steel box shelter on a 2-foot culvert pipe well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and SDR log as backups. Record is complete and reliable except for Nov. 24, 2008 through Mar. 20, 2009 when the station was closed for the winter. Stage discharge relationship was affected by ice Nov. 21-23, 2008, Mar. 28, Apr. 1, 2, 5, 6, 12 and 13, 2009.

Datum Corrections.-- Levels were not run to the Reference Point (RP) inside the gage this year due to the stability of elevations. Levels were last run on August 5, 2008 using B.M. 1 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made.

Rating.-- The control is a rock weir approximately 3 feet below the gage. Shifting occurs mainly due to the movement of rocks in the weir, both naturally and with human intervention. Rating No. 4-3, extended from 4-2 was used this year. This rating is considered fair. It is fairly well defined from 1 to 12 cfs. Eighteen measurements (Nos. 149-166) were made this year ranging in discharge from 0.51 to 10.8 cfs. They cover the discharge range experienced except for higher daily flows on May 18-20, 23-25, 31, Jun. 4, 5, 19-29, 2009; and lower daily flows on Dec. 26-31, 2008, Jan. 1-23, 27-31, Feb. 1-5, 11-15, 18-22, 28, Mar. 1, 2, 7-9, 11, 2009. The peak flow of 115 cfs occurred at 00:15 on June 27, 2009 at a gage-height of 3.90 ft. with a shift of +0.18 ft. It exceeded high measurement No. 159 made on May 26, 2009 (GH=3.44 ft.) by 0.46 ft. in stage.

Discharge.-- Shifting control method was used during all open water periods. Open water measurements show shifts varied from -0.02 and +0.01 ft. before control washed out, from +0.18 to +0.27 ft. after washout, and from +0.07 to +0.14 ft. after rebuilding control. All were given full weight except for Nos. 149, 157, 158, 160 and 164, which were adjusted by as much as 8% to smooth shift distribution.

Special Computations.-- Discharge for period of no gage-height and ice affected record was estimated using five discharge measurements, comparison with nearby stations, and weather records. A hydrograph was used.

Remarks.-- Record is fair except for periods of no gage-height and ice affected record, which are poor. The period of Jun. 25 to Jul. 7, 2009, including the peak discharge, should be considered poor due to necessary extrapolation of the rating curve and shift uncertainty caused by the eroding control. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SPANISH CREEK NEAR CRESTONE

RATING TABLE--

SPACRECO04-3 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

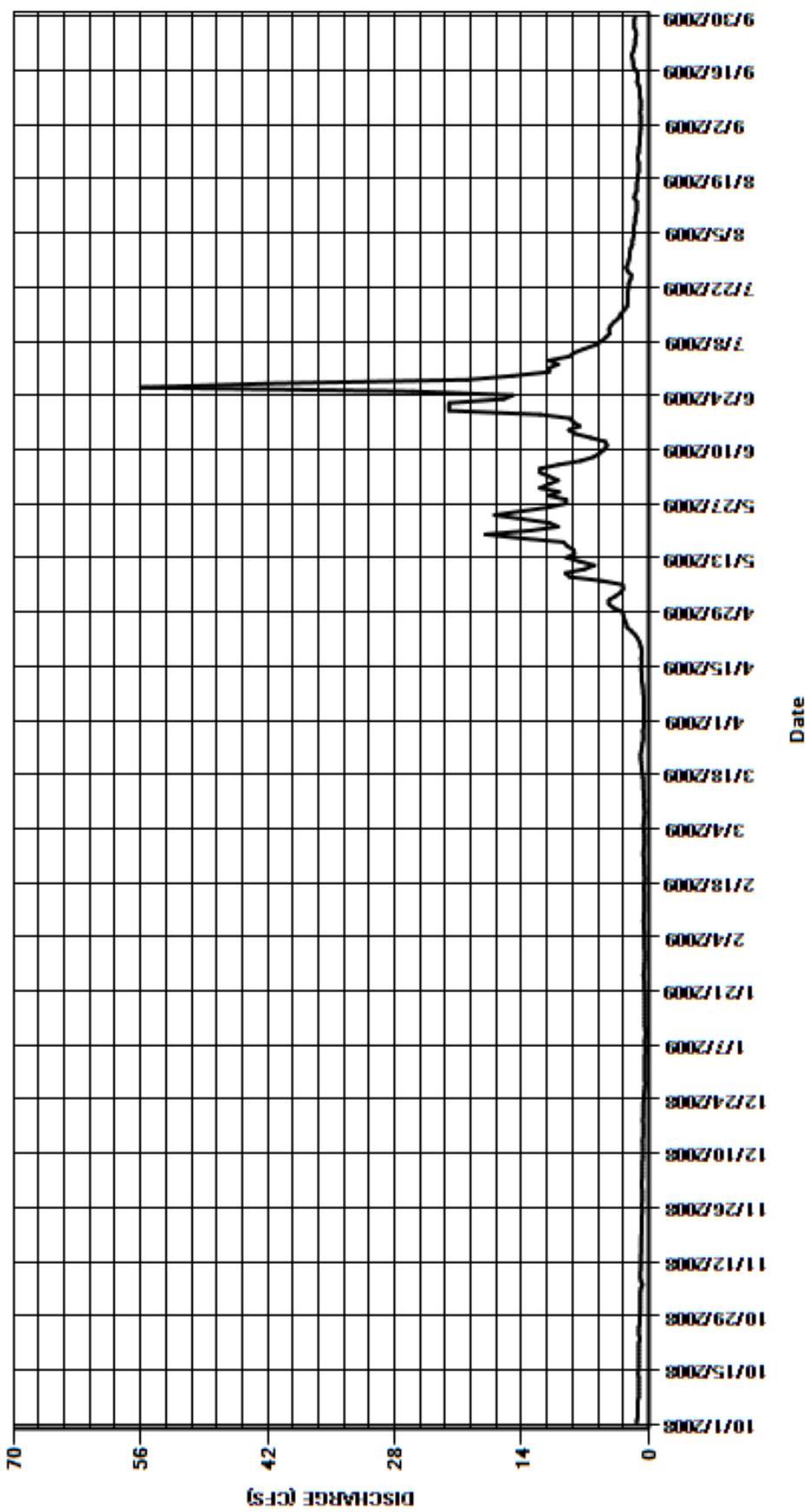
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	0.93	0.75	0.45	0.5	0.5	0.58	4.4	11	11	2	0.9
2	1.3	0.93	0.75	0.45	0.5	0.5	0.58	4.4	10	10	1.8	0.88
3	1.2	0.93	0.75	0.45	0.5	0.55	0.58	3.7	11	11	1.8	0.88
4	1.2	0.93	0.7	0.45	0.5	0.6	0.55	3.1	12	8.8	1.7	0.89
5	1.2	0.88	0.7	0.4	0.5	0.6	0.54	2.8	12	8.2	1.6	0.95
6	1.2	0.69	0.7	0.4	0.55	0.55	0.55	2.9	10	7.1	1.7	0.9
7	1.2	0.88	0.7	0.45	0.55	0.5	0.57	5.2	7.5	5.9	1.6	0.86
8	1.1	0.95	0.7	0.45	0.6	0.45	0.63	8.7	6.1	5.2	1.5	0.87
9	1.1	0.93	0.65	0.4	0.55	0.5	0.64	9.2	5.4	4.7	1.5	0.96
10	1.1	0.9	0.65	0.35	0.55	0.55	0.68	7.1	4.9	4.3	1.4	1
11	1.1	0.87	0.65	0.4	0.5	0.5	0.77	6	4.6	4.4	1.3	1
12	1.1	0.87	0.65	0.45	0.5	0.55	0.75	7.6	4.8	4.2	1.3	1.1
13	1.1	0.87	0.7	0.45	0.5	0.55	0.8	9.1	6.4	3.8	1.3	1.3
14	1.2	0.87	0.65	0.45	0.5	0.6	0.82	8.2	8.1	3.3	1.6	1.2
15	1.1	0.85	0.6	0.45	0.5	0.6	0.82	8.3	8.8	3.1	1.5	1.2
16	1.1	0.86	0.6	0.45	0.55	0.6	0.8	9	7.6	2.7	1.3	1.4
17	1.1	0.84	0.6	0.45	0.55	0.65	0.84	9.4	8.3	2.4	1.3	1.7
18	1.1	0.84	0.65	0.45	0.5	0.7	0.77	14	8.7	2.3	1.3	1.7
19	1.1	0.81	0.65	0.45	0.45	0.75	0.78	18	12	2.3	1.2	1.8
20	1.1	0.8	0.6	0.45	0.5	0.8	0.88	13	22	2.3	1.2	1.9
21	1.1	0.8	0.6	0.5	0.5	0.84	1	10	22	2.3	1.1	1.7
22	1.1	0.78	0.6	0.5	0.5	0.89	1.2	11	22	2.2	1.1	1.6
23	0.96	0.75	0.6	0.5	0.55	0.92	1.5	14	16	2.2	1.1	1.5
24	1.1	0.75	0.55	0.55	0.55	0.82	1.9	17	15	2	1.2	1.5
25	1.1	0.7	0.55	0.6	0.6	0.76	2.4	14	26	1.9	1.2	1.4
26	1.1	0.75	0.5	0.55	0.6	0.71	2.5	11	56	2.3	1.1	1.4
27	1	0.75	0.45	0.5	0.55	0.61	2.7	9.1	42	2.5	1.1	1.6
28	1	0.7	0.4	0.5	0.5	0.6	2.8	9.1	20	2.3	1	1.6
29	0.99	0.7	0.45	0.45	---	0.66	2.9	11	15	2.2	1	1.6
30	0.95	0.7	0.45	0.45	---	0.58	3.9	9.9	11	2.1	0.98	1.5
31	0.93	---	0.45	0.45	---	0.58	---	12	---	2.1	0.94	---
TOTAL	34.33	24.81	19.00	14.25	14.70	19.57	36.73	282.2	426.2	131.1	41.72	38.79
MEAN	1.11	0.83	0.61	0.46	0.53	0.63	1.22	9.1	14.2	4.23	1.35	1.29
AC-FT	68	49	38	28	29	39	73	560	845	260	83	77
MAX	1.3	0.95	0.75	0.6	0.6	0.92	3.9	18	56	11	2	1.9
MIN	0.93	0.69	0.4	0.35	0.45	0.45	0.54	2.8	4.6	1.9	0.94	0.86
CAL YR	2008	TOTAL	856.39	MEAN	2.34	MAX	22	MIN	0.4	AC-FT	1700	
WTR YR	2009	TOTAL	1083.40	MEAN	2.97	MAX	56	MIN	0.35	AC-FT	2150	

MAX DISCH: 115 CFS AT 00:15 ON Jun. 27,2009 GH 3.9 FT. SHIFT 0.18 FT.

MAX GH: 3.96 FT. AT 19:15 ON Jun. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SPANISH CREEK NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08229500 COTTONWOOD CREEK NEAR CRESTONE
Water Year 2009

Location.-- Lat. 37°56'51", Long. 105°39'05", UTM X 443269.4, Y 4198614.6, T.43 N., R.12 E., NMPM, Saguache Co., on left bank of channel approximately 500 feet south of road, 5 miles SE of Crestone.

Drainage and Period of Record.-- 5.0 mi².

Equipment.-- Data collection platform (Sutron Model 8200) and a float-operated shaft encoder in a 3 ft. by 3 ft. timber shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. On Aug. 13, 2009, the DCP and shaft encoder were replaced with a Sutron Model Satlink Logger with HDR GOES radio and float operated Sutron SDR.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and SDR log as backup. Gage-height record is complete and reliable except for Nov. 6-23, 2008 and Mar. 27 through Apr. 12, 2009 when the well was frozen; Nov. 24, 2008 through Mar. 20, 2009 when station was closed for the winter; and Jun. 26 through Jul. 7, 2009 when inlets were buried. Stage-discharge relation was affected by ice April 17, 2009. There were no instrument corrections made to the shaft encoder or SDR. A +0.02 foot flush correction was made on May 14, 2009 and prorated from previous point of inflection on the GH graph. A -0.04 ft gage-height correction due to removing rocks from control on Jul. 28, 2009 was distributed back to Jul. 26 when it was assumed the rocks lodged on control.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Aug. 5, 2008 to the Reference Point (RP) inside the gage using BM #3 as base. The RP was within allowable limits, a correction was not made.

Rating.-- The control is a cobble riffle approximately 6 feet below the gage. Shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating No. 5 was created and used for last year's record. Rating No. 5-1, created and used for this water year, is identical to No. 5 except the upper end was straight-line extended to cover this year's peak. It is fairly well defined from 0.7 to 50 cfs. Sixteen discharge measurements (Nos. 152-167) were made during the year ranging from 0.89 to 26.3 cfs. They cover the discharge range experienced except for lower daily flows on Jan. 28 to Feb. 1, 2009 and higher daily flows of Jun. 2-5, 20-23, 25-27, 2009. The peak of 313 cfs occurred at 19:15 on Jun. 25, 2009 at a gage-height of 3.56 feet with a shift of 0.00 feet. It exceeded high measurement No. 161 (GH = 2.47), made May 26, 2009, by 1.09 feet in stage.

Discharge.-- Shifting control method was used during all open water periods. Two variable shift curves were used from Mar. 20 to Jun. 25, 2009 and Jul. 7 to Sep. 23, 2009 to distribute shifts according to stage. During other periods, shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied between -0.08 and +0.04 feet. All measurements were given full weight except Nos. 152, 160, and 165 which were adjusted by as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of winter no gage-height and ice affected record were estimated using five discharge measurements and weather records. Discharge for period of buried inlets was estimated by distributing the +0.38 ft. gage-height correction through the period using nearby gage 'Deadman Creek near Crestone' as a reference. The gage-heights through this period appear to resemble reality in timing and range, but are much too low. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. The maximum instantaneous peak discharge should also be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08229500 COTTONWOOD CREEK NEAR CRESTONE

RATING TABLE--

COCRESCO05-1 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	2.2	2	1.2	0.8	1.1	1.2	8.5	26	20	4.3	1.7
2	3.5	2.2	2.1	1.3	0.9	1.2	1.2	8.8	28	21	4	1.6
3	3.4	2.2	2.1	1.3	0.9	1.3	1.3	6.8	30	22	3.8	1.6
4	3.4	2.1	2	1.1	0.9	1.4	1.3	6.1	30	19	3.6	1.6
5	3.4	2	1.9	1	1	1.4	1.2	5.8	30	19	3.5	1.9
6	3.4	1.7	1.9	0.9	1.1	1.4	1.2	6.5	25	18	3.3	1.9
7	3.3	1.7	1.9	0.9	1.2	1.3	1.3	12	21	16	3.3	1.7
8	3.2	1.9	1.9	1	1.2	1.2	1.4	20	18	15	3.1	1.7
9	3.1	2.1	1.7	1	1.1	1.2	1.4	19	16	14	2.8	1.8
10	2.9	2.1	1.6	0.9	1	1.2	1.4	17	14	13	2.7	1.8
11	2.9	2.1	1.6	0.9	0.9	1.2	1.4	15	14	14	2.5	1.7
12	3	2.1	1.6	0.9	0.9	1.2	1.4	20	14	13	2.5	1.7
13	2.8	2.2	1.7	1	0.9	1.2	1.5	23	18	12	2.4	2.2
14	2.9	2.2	1.6	1	0.9	1.1	1.4	22	20	11	3	2
15	2.9	2.1	1.5	1	0.9	1.1	1.4	24	21	10	2.8	2
16	2.8	2.1	1.5	1	1	1.2	1.4	27	19	9.1	2.5	2.3
17	2.8	2.2	1.6	1	1	1.2	1.4	30	21	8.3	2.3	2.8
18	2.7	2.3	1.7	1	1	1.3	1.4	35	22	7.9	2.3	2.7
19	2.6	2.3	1.7	1.1	0.9	1.3	1.4	37	25	7.9	2.2	2.8
20	2.5	2.2	1.6	1.1	0.9	1.4	1.6	31	42	7.6	2.1	2.8
21	2.5	2.1	1.5	1.1	0.9	1.6	2.2	26	40	7.3	2	2.6
22	2.4	2.1	1.5	1.1	1	1.9	3.2	27	36	7.3	1.9	2.5
23	2.2	2.1	1.5	1.2	1.2	2	3.9	30	30	7	1.8	2.5
24	2.5	2.1	1.5	1.3	1.3	1.7	4.4	39	25	6.6	2.1	2.4
25	2.4	2.1	1.5	1.3	1.3	1.6	4.7	31	59	6.2	2.2	2.5
26	2.4	2.1	1.5	1.2	1.3	1.5	4.3	26	51	6.7	2	2.4
27	2.3	2.1	1.3	1	1.2	1.3	4.3	24	43	6.3	1.9	2.4
28	2.3	2.1	1.1	0.8	1.1	1.2	4.5	26	29	5.4	1.8	2.4
29	2.2	2	1	0.8	---	1.3	4.8	27	23	4.8	1.8	2.4
30	2.2	2	1.1	0.8	---	1.3	6.9	23	20	4.6	1.8	2.3
31	2.2	---	1.2	0.8	---	1.2	---	26	---	4.6	1.7	---
TOTAL	86.6	62.8	49.9	32.00	28.70	41.5	70.4	679.5	810	344.6	80.0	64.7
MEAN	2.79	2.09	1.61	1.03	1.02	1.34	2.35	21.9	27	11.1	2.58	2.16
AC-FT	172	125	99	63	57	82	140	1350	1610	684	159	128
MAX	3.5	2.3	2.1	1.3	1.3	2	6.9	39	59	22	4.3	2.8
MIN	2.2	1.7	1	0.8	0.8	1.1	1.2	5.8	14	4.6	1.7	1.6

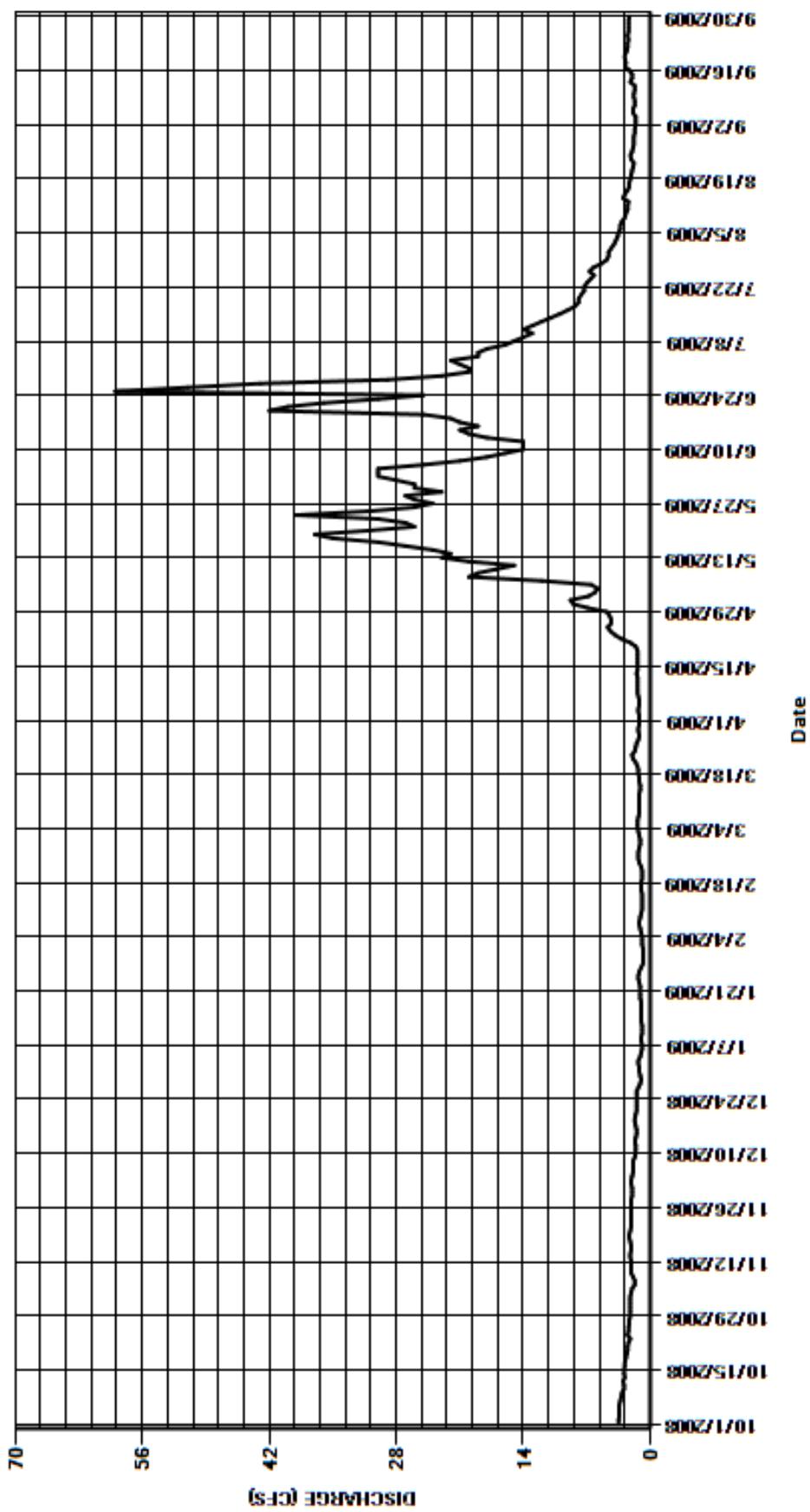
CAL YR	2008	TOTAL	2341.20	MEAN	6.4	MAX	40	MIN	0.9	AC-FT	4640
WTR YR	2009	TOTAL	2350.70	MEAN	6.44	MAX	59	MIN	0.8	AC-FT	4660

MAX DISCH: 313 CFS AT 19:15 ON Jun. 25,2009 GH 3.56 FT. SHIFT 0 FT.

MAX GH: 3.56 FT. AT 19:15 ON Jun. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08229500 COTTONWOOD CREEK NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
DEADMAN CREEK NEAR CRESTONE
Water Year 2009

Location.-- Lat. 37°53'05", Long. 105°38'47", UTM X 443109.5, Y 4193221.7, in NE1/4, SE1/4, Sec. 3, T.42 N., R.12 E., NMPM, Saguache Co., on right bank 8 miles SE of Crestone.

Drainage and Period of Record.-- 8.4 mi².

Equipment.-- Data collection platform (Sutron Model 8200) and a float-operated shaft encoder in a 2 foot steel culvert pipe stilling well with a small steel box-type shelter atop well. The well is connected to a non-standard 6 foot Parshall Flume in fair condition. On Aug. 13, 2009 the DCP and shaft encoder were upgraded to Sutron Model Satlink Logger with HDR GOES radio and float-operated SDR. Gage-height set from staff gage in a non-standard Parshall Flume.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable except for Nov. 6, 7, 2008, Aug. 13, 14, 18-31, Sep. 1-14, 29, 30 when the gage-height dropped below 0.06 ft. and the gage isolated, Sep. 21 – 23, when the inlet was plugged, and Nov. 24, 2008 through April 8, 2009 when the station was closed for the winter. The stage-discharge relation was affected by ice Nov. 15, 2008. There were two instrumentation corrections made to the shaft encoder; one of -0.02 feet another of +0.02 feet. These corrections were prorated by time from previous visit.

Datum Corrections.-- A formal inspection with levels was not performed this year. The Parshall flume was inspected and levels were shot on Aug. 5, 2008.

Rating.-- Rating No. 1, a standard six foot Parshall flume rating, was used all year. Minor shifting occurs due to non-standard flume dimensions, approach velocity, and approach angle. Only 7 discharge measurements (Nos. 39-45) were made during the water year because of limited access to the station. The measured discharges ranged from 0.27 to 34.5 cfs. They cover the discharge range experienced except for higher daily flows on May 9, 12-20, 24, 31, Jun. 1–5, 21, 26, 27, 2009, and lower daily flows Dec. 23, 2008 through Mar. 3, 2009, Mar. 10-16, Aug. 18-31, and Sep. 1-12, 2009. There was no flow at the station from Dec. 30, 2008 to Feb. 20, 2009 (estimated). The peak flow of 83.2 cfs occurred at 21:00 on Jun. 25, 2009 at a gage-height of 2.12 feet (GH correction of -0.01 ft applied) with a shift of +0.06 feet. It exceeded high measurement No. 42 (GH = 1.19), made May 14, 2009, by 0.93 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. A variable shift curve was used from April 8, 2009 until the end of the water year. Two measurements (35, 36) were added to the curve from the previous water year to better define the median range of gage-height. During other periods, shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied from -0.02 to +0.06 ft. All were given full weight except Nos. 39 and 44 which were adjusted by as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using four measurements, comparison with nearby stations, and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. The peak discharge should also be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DEADMAN CREEK NEAR CRESTONE

RATING TABLE--

DEDCRECO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

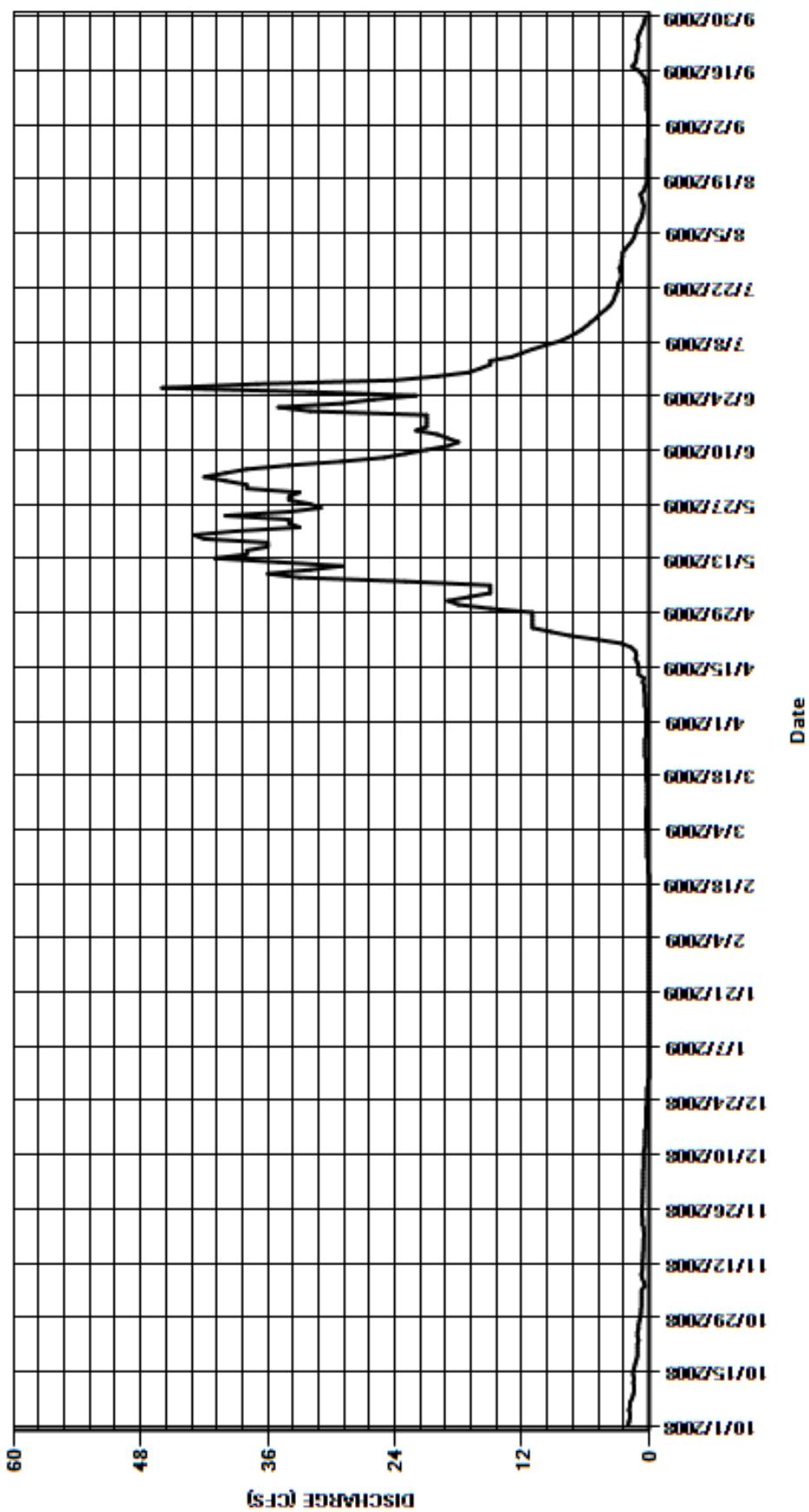
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2	0.71	0.6	0	0	0.2	0.3	18	38	16	2.2	0.1
2	1.9	0.71	0.55	0	0	0.2	0.3	19	40	15	1.9	0.1
3	1.8	0.69	0.55	0	0	0.2	0.3	17	42	15	1.6	0.1
4	1.8	0.71	0.55	0	0	0.3	0.3	15	40	13	1.4	0.1
5	1.9	0.71	0.55	0	0	0.3	0.4	15	38	12	1.3	0.1
6	1.8	0.4	0.55	0	0	0.3	0.4	15	34	11	1.2	0.2
7	1.8	0.5	0.5	0	0	0.3	0.4	23	29	9.8	1.1	0.2
8	1.6	0.65	0.5	0	0	0.3	0.4	33	25	8.5	0.88	0.2
9	1.5	0.73	0.5	0	0	0.3	0.49	36	23	7.7	0.71	0.2
10	1.4	0.64	0.5	0	0	0.2	0.44	32	21	7	0.61	0.2
11	1.4	0.61	0.5	0	0	0.2	0.61	29	19	6.4	0.56	0.2
12	1.5	0.61	0.4	0	0	0.2	0.47	35	18	5.9	0.49	0.2
13	1.4	0.6	0.4	0	0	0.2	1	41	19	5.5	0.6	0.4
14	1.5	0.59	0.4	0	0	0.2	0.98	38	20	5	0.7	0.35
15	1.5	0.55	0.4	0	0	0.2	1	38	22	4.7	0.82	0.69
16	1.4	0.54	0.4	0	0	0.2	1.1	36	21	4.2	0.5	1
17	1.3	0.52	0.3	0	0	0.3	1.3	36	21	3.8	0.37	1.6
18	1.2	0.52	0.3	0	0	0.3	1.2	42	21	3.5	0.2	1.3
19	1.1	0.49	0.3	0	0	0.3	1.3	43	21	3.3	0.2	1.2
20	1.1	0.51	0.3	0	0	0.3	1.7	39	32	3.2	0.2	1.2
21	1.1	0.51	0.3	0	0.1	0.3	2.6	33	35	3	0.2	1.1
22	1.1	0.65	0.3	0	0.1	0.3	4.9	34	29	3	0.2	1
23	1	0.6	0.2	0	0.1	0.4	7.5	34	26	2.9	0.2	1
24	1.1	0.65	0.2	0	0.1	0.4	9.3	40	22	2.7	0.2	1.1
25	1.1	0.65	0.2	0	0.2	0.4	11	34	32	2.6	0.15	1
26	1	0.65	0.2	0	0.2	0.4	11	31	46	2.7	0.15	0.85
27	1	0.65	0.2	0	0.2	0.4	11	32	37	2.8	0.15	0.68
28	0.92	0.6	0.1	0	0.2	0.3	11	34	24	2.6	0.15	0.52
29	0.82	0.6	0.1	0	---	0.3	11	34	20	2.6	0.15	0.42
30	0.78	0.6	0	0	---	0.3	15	33	17	2.5	0.1	0.34
31	0.76	---	0	0	---	0.3	---	38	---	2.5	0.1	---
TOTAL	41.58	18.15	10.85	0.00	1.20	8.80	108.69	977	832	190.4	19.29	17.65
MEAN	1.34	0.61	0.35	0	0.043	0.28	3.62	31.5	27.7	6.14	0.62	0.59
AC-FT	82	36	22	0	2.4	17	216	1940	1650	378	38	35
MAX	2	0.73	0.6	0	0.2	0.4	15	43	46	16	2.2	1.6
MIN	0.76	0.4	0	0	0	0.2	0.3	15	17	2.5	0.1	0.1
CAL YR	2008	TOTAL	2132.38	MEAN	5.83	MAX	39	MIN	0	AC-FT	4230	
WTR YR	2009	TOTAL	2225.61	MEAN	6.1	MAX	46	MIN	0	AC-FT	4410	

MAX DISCH: 83 CFS AT 21:00 ON Jun. 25,2009 GH 2.12 FT. SHIFT 0.06 FT. (GH CORR -0.01 FT. APPLIED)

MAX GH: 2.12 FT. AT 21:00 ON Jun. 25,2009 (GH CORR -0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DEADMAN CREEK NEAR CRESTONE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO
Water Year 2009

Location.-- Lat. $37^{\circ}42'49''$, Long. $105^{\circ}38'55''$, UTM X 442783.5, Y 4174237.4, in the NE $\frac{1}{4}$ SW $\frac{1}{4}$, sec. 15, T.40 N., R.12 E., New Mexico Principal Meridian, in Alamosa county.

Drainage and Period of Record.-- 0.2 mi². Flow primarily due to groundwater accretions. First record produced for water year 2000.

Equipment.-- Float-operated Sutron SDR with SDI-12 radio bridge in a 30 inch diameter pipe stilling well and CMP extension for gage shelter. The gage-height data is transmitted via radio bridge to data collection platform (Sutron Satlink Logger) at Big Spring Creek at Medano Ranch near Mosca. The primary reference gage is a staff gage in the 2-foot Parshall flume.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with SDR and DCP log as backup. Record is complete and reliable except for Jun. 9, 10, 2009 when there was missing data and Dec. 11, 2008 through Mar. 11, 2009 when the station was closed for the winter. There was one instrumentation correction made to the shaft encoder of -0.01 ft. on Apr. 8, 2009, which was prorated by time back to previous visit. There were also two cleaning corrections of +0.02 ft. that were prorated by time back to previous visits.

Datum Corrections.-- A formal inspection with levels was not performed this year. The last Parshall flume inspection and levels were completed on July 3, 2008, with an assumed elevation of 0.000 ft at the flume floor adjacent to the staff gage (REW). Levels indicate that the flume floor slopes approximately 2% with the floor at the staff gage (REW) 0.076' lower than the well inlet (LEW). The flume also slopes slightly downward toward diverging section. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- A standard two-foot Parshall flume rating was used all year. Sand and moss build-up in approach and inside the flume requires occasional cleaning. Fifteen measurements (Nos. 98-112) were made this year ranging in discharge from 1.30 to 1.99 cfs. They cover the discharge range experienced this year except for the lower daily flows on Jul. 24-31, Aug. 1-13, 15-31, Sep. 1-6, 2009 and the higher daily flows on Mar. 27, Apr. 13, 17, 18, 2009. The peak flow of 6.33 cfs occurred at 11:15 on Mar. 27, 2009 at a gage-height of 0.87 ft (GH correction of -0.01 ft applied) with a shift of -0.01 ft. It exceeded high measurement No. 104 (GH=0.42 ft) made Apr. 8, 2009 by 0.45 ft. in stage.

Discharge.-- Shifting control method was used during all periods of gage-height record. Measurements show shifts varied from -0.04 to +0.01 ft. All were given full weight except for Nos. 103, 106, 108, and 110, which were adjusted by as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height was estimated using five discharge measurements, comparison with nearby station Big Spring Creek at Medano Ranch, and weather records.

Remarks.-- Record is good except for periods of no gage-height, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO

RATING TABLE--

STD2FTPF USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	1.6	1.6	1.6	1.7	1.7	1.8	1.9	1.8	1.4	1.2	1.2
2	1.5	1.6	1.6	1.7	1.7	1.7	1.8	1.9	1.8	1.5	1.2	1.2
3	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9	1.7	1.5	1.2	1.2
4	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9	1.7	1.5	1.2	1.2
5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9	1.7	1.6	1.2	1.1
6	1.5	1.6	1.6	1.6	1.7	1.8	1.8	1.8	1.6	1.6	1.1	1.2
7	1.5	1.6	1.6	1.6	1.8	1.8	1.8	1.8	1.6	1.7	1.1	1.3
8	1.5	1.6	1.7	1.6	1.8	1.8	1.8	1.8	1.6	1.7	1.1	1.3
9	1.5	1.7	1.6	1.6	1.8	1.8	1.8	1.8	1.6	1.7	1.1	1.3
10	1.4	1.7	1.6	1.6	1.7	1.8	1.8	1.8	1.7	1.8	1.1	1.3
11	1.5	1.7	1.6	1.6	1.7	1.8	1.9	1.8	1.7	1.8	1.2	1.3
12	1.5	1.7	1.6	1.6	1.7	1.8	2	1.7	1.6	1.7	1.2	1.4
13	1.5	1.7	1.6	1.6	1.7	1.8	2.1	1.7	1.6	1.6	1.2	1.5
14	1.6	1.6	1.6	1.6	1.7	1.9	1.9	1.7	1.6	1.6	1.3	1.3
15	1.6	1.7	1.6	1.7	1.7	1.9	1.9	1.7	1.6	1.4	1.2	1.3
16	1.5	1.7	1.6	1.7	1.7	1.9	1.9	1.7	1.5	1.4	1.2	1.4
17	1.5	1.7	1.6	1.7	1.7	1.9	2.4	1.7	1.4	1.3	1.2	1.4
18	1.5	1.7	1.6	1.7	1.7	1.9	2.1	1.7	1.5	1.3	1.1	1.4
19	1.5	1.7	1.6	1.7	1.7	1.9	2	1.6	1.4	1.3	1.2	1.4
20	1.5	1.6	1.6	1.7	1.7	1.8	1.9	1.7	1.5	1.3	1.1	1.4
21	1.5	1.6	1.6	1.7	1.7	1.9	1.9	1.8	1.5	1.3	1.2	1.4
22	1.5	1.6	1.6	1.7	1.7	1.8	1.9	1.8	1.4	1.3	1.1	1.5
23	1.5	1.6	1.6	1.7	1.8	1.9	1.9	1.8	1.4	1.3	1.1	1.5
24	1.5	1.6	1.6	1.7	1.8	1.9	1.9	1.8	1.4	1.2	1.2	1.5
25	1.5	1.6	1.6	1.8	1.8	1.8	1.9	1.7	1.7	1.2	1.2	1.5
26	1.5	1.6	1.5	1.8	1.8	1.8	1.9	1.9	1.6	1.2	1.2	1.5
27	1.5	1.6	1.5	1.8	1.8	2.8	1.9	1.8	1.5	1.2	1.1	1.4
28	1.6	1.7	1.5	1.7	1.7	1.9	1.9	1.8	1.5	1.1	1.1	1.4
29	1.6	1.6	1.6	1.7	---	1.8	1.9	1.7	1.5	1.1	1.1	1.4
30	1.6	1.6	1.6	1.7	---	1.8	1.8	1.7	1.4	1.1	1.1	1.4
31	1.6	---	1.6	1.7	---	1.8	---	1.7	---	1.2	1.2	---
TOTAL	46.9	49.1	49.4	52.0	48.4	57.6	57.0	55.0	47.1	43.9	36.0	40.6
MEAN	1.51	1.64	1.59	1.68	1.73	1.86	1.9	1.77	1.57	1.42	1.16	1.35
AC-FT	93	97	98	103	96	114	113	109	93	87	71	81
MAX	1.6	1.7	1.7	1.8	1.8	2.8	2.4	1.9	1.8	1.8	1.3	1.5
MIN	1.4	1.6	1.5	1.6	1.7	1.7	1.8	1.6	1.4	1.1	1.1	1.1

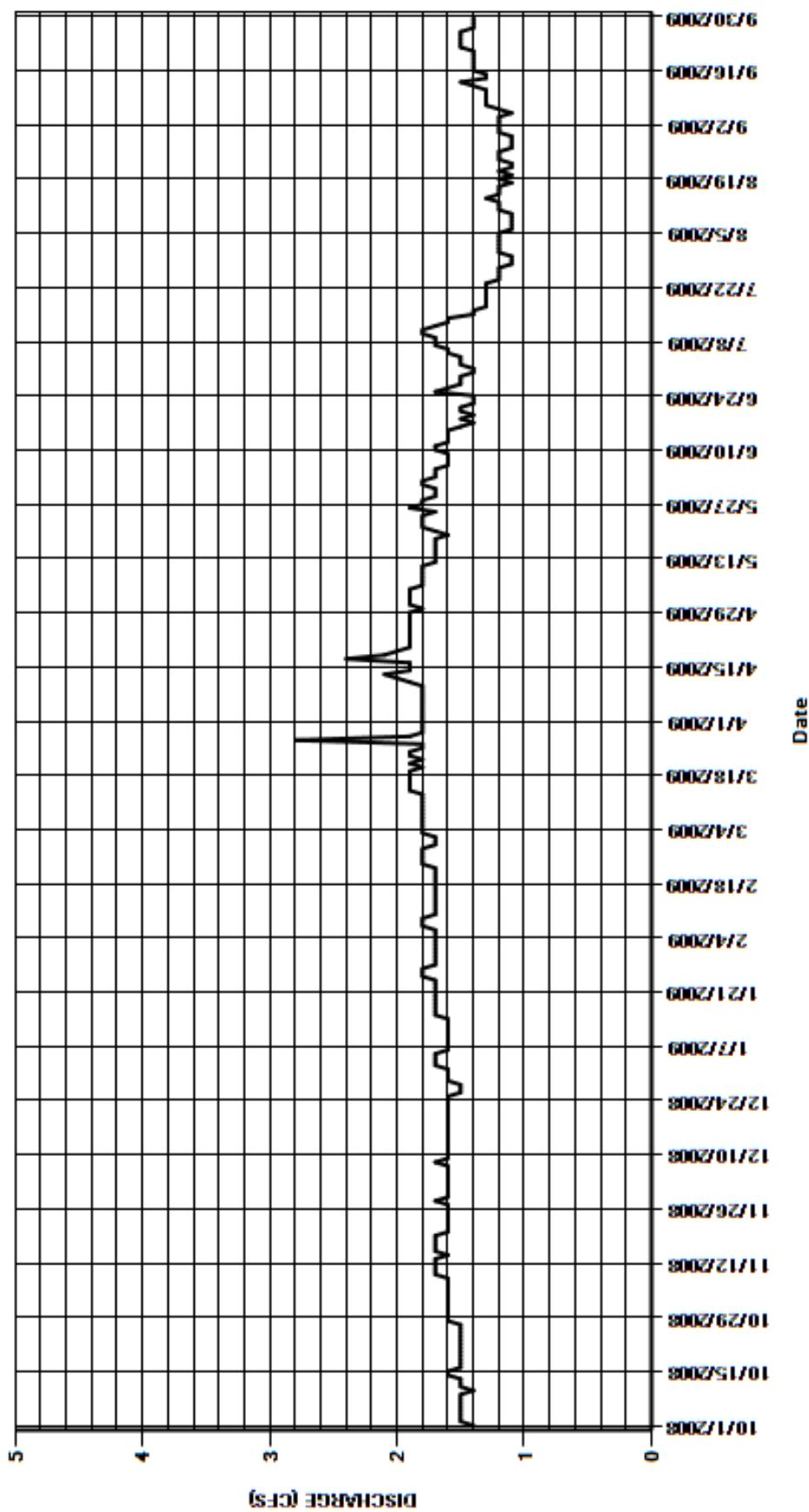
CAL YR	2008	TOTAL	587.2	MEAN	1.6	MAX	2.1	MIN	1.2	AC-FT	1160
WTR YR	2009	TOTAL	583.0	MEAN	1.6	MAX	2.8	MIN	1.1	AC-FT	1160

MAX DISCH: 6.3 CFS AT 11:15 ON Mar. 27,2009 GH 0.87 FT. SHIFT -0.01 FT. (GH CORR -0.01 APPLIED)

MAX GH: 0.87 FT. AT 11:15 ON Mar. 27,2009 (GH CORR -0.01 APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
Water Year 2009

Location.-- Lat. 37°44'03", Long. 105°39'50", UTM X 441450.8, Y 4176532.5, in NE ¼ NW ¼ Sec. 9, T.40 N., R.12 E., NMPM, Alamosa Co., on left bank approximately ¼ mile above Los Ojos Diversion.

Drainage and Period of Record.-- 0.3 mi². First record produced in 1999. Flow primarily due to groundwater accretions.

Equipment.-- Data collection platform (Sutron SatLink Logger with HDR GOES radio), and a float-operated shaft encoder in a 30 inch diameter pipe well and CMP extension gage shelter. The primary reference gage is a staff gage at REW in the 4 foot Parshall flume. No auxiliary gage. The flume had a modification insert until July 7, 2009 when it was removed and a standard four foot rating was put into use.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable except for Dec. 11, 2008 through Mar. 11, 2009 when the station was closed for the winter. The stage-discharge relation was affected by ice Nov. 6, 7, 2008 and Mar. 27, 31, 2009. There were several small back and forth instrumentation corrections made to the shaft encoder and several small flush corrections taken later in the record year. These are assumed to be related to the sand deposits in the flume due to the backwater conditions.

Datum Corrections.-- A formal inspection with levels was not performed this year. Since this Parshall Flume had been modified with ramp insert at the throat, it was not expected to perform as a Parshall flume. Inspection and levels were last completed on the flume on July 3, 2008, with an assumed elevation of 0.000 ft at the flume floor adjacent to the staff gage at REW. Levels indicate that the flume floor slopes inconsistently downward toward REW by approximately 0.06 ft. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- The control was a standard four foot Parshall flume until July 24, 2006, when it was modified in an attempt to eliminate submergence. On July 7, 2009 the modification piece was removed and the standard rating was put back in use. Before the modification, the flume was continuously submerged to some extent, and the submergence became worse. Shifting is caused by continuously changing sand deposition in, above, and below flume. Eighteen discharge measurements (Nos. 87-104) were made during the year ranging in discharge from 5.42 to 7.31 cfs. They cover the discharge range encountered except for the lower daily flows of Jun. 30, Jul. 2, 4-7, 9-13, 15, 18-21, 23-26, 28-30, Aug. 3-9, 11-13, 17-24, 30, 31, Sep. 1-4, 2009, and the higher daily flows on Mar. 27, 28, Apr. 12, 13, 17-19, May 22, 27, 28, 2009. The peak flow of 10 cfs occurred at 17:00 on April 13, 2009 at a gage-height of 1.35 ft. with a shift of -0.01 ft. It exceeded measurement No. 93 (GH 1.18 ft) made April 8, 2009 by 0.17 ft in stage. The maximum gage-height of 1.69 ft. (ice affected) occurred at 12:45 on March 27, 2009.

Discharge.-- Shifting control method was used during all open water periods. Measurements show shifts varied from -0.15 to 0 ft. while rating No. 02 was in use and from -0.76 to -0.67 ft. after the modification was removed and standard 4 ft. rating was in use. All were given full weight except for Nos. 93, 94, 99, 100, and 103, which were adjusted by as much as 8% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated on the basis of four measurements, weather records, and comparison with nearby station Little Spring Creek at Medano Ranch. A hydrograph was used.

Remarks.-- Record is fair except for periods of flume submergence, no gage-height, and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA

RATING TABLE--

BIGSPGCO02 USED FROM 01-Oct-2008 TO 07-Jul-2009
STDPF4FT USED FROM 07-Jul-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

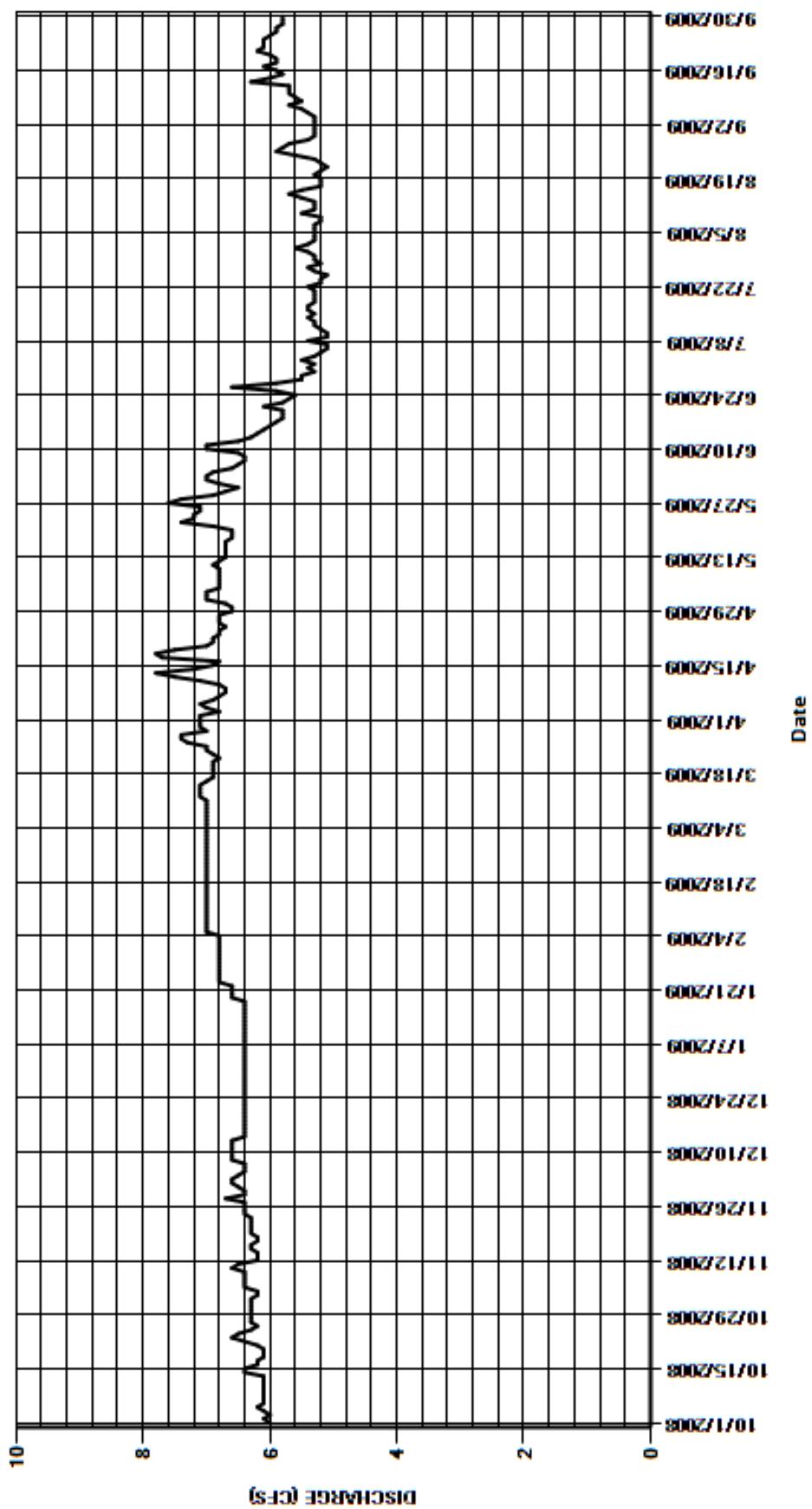
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6	6.3	6.5	6.4	6.8	7	7.1	6.7	6.8	5.4	5.6	5.3
2	6.1	6.3	6.6	6.4	6.8	7	7.1	7	7	5.3	5.4	5.3
3	6	6.2	6.6	6.4	6.8	7	6.8	7	7	5.5	5.3	5.3
4	6.1	6.2	6.5	6.4	6.8	7	7	7	6.9	5.3	5.3	5.3
5	6.2	6.4	6.4	6.4	7	7	7.1	6.8	6.6	5.2	5.3	5.4
6	6.1	6.4	6.4	6.4	7	7	6.9	6.8	6.5	5.1	5.3	5.5
7	6.1	6.4	6.4	6.4	7	7	6.8	6.8	6.4	5.1	5.3	5.7
8	6.1	6.4	6.6	6.4	7	7	6.7	6.8	6.4	5.4	5.2	5.5
9	6.1	6.4	6.6	6.4	7	7	6.7	6.8	6.5	5.1	5.2	5.6
10	6.1	6.6	6.6	6.4	7	7	6.8	6.8	7	5.1	5.5	5.7
11	6.1	6.5	6.6	6.4	7	7	7.1	6.9	7	5.2	5.3	5.7
12	6.1	6.2	6.6	6.4	7	7.1	7.5	6.8	6.5	5.3	5.3	5.7
13	6.1	6.2	6.6	6.4	7	7.1	7.8	6.7	6.3	5.3	5.3	6.3
14	6.4	6.2	6.4	6.4	7	7.1	7.2	6.7	6.2	5.4	5.5	6
15	6.4	6.3	6.4	6.4	7	7.1	6.9	6.7	6.1	5.3	5.7	5.8
16	6.2	6.3	6.4	6.4	7	7	6.8	6.7	6	5.4	5.5	5.9
17	6.2	6.2	6.4	6.4	7	6.9	7.7	6.7	5.9	5.4	5.2	6.1
18	6.1	6.2	6.4	6.4	7	6.9	7.8	6.6	5.8	5.3	5.2	5.9
19	6.1	6.3	6.4	6.6	7	6.9	7.5	6.6	5.8	5.3	5.2	5.9
20	6.1	6.3	6.4	6.6	7	6.9	7	6.6	5.8	5.3	5.3	6
21	6.2	6.3	6.4	6.6	7	6.9	6.9	6.9	6.1	5.3	5.2	6.2
22	6.4	6.3	6.4	6.6	7	6.8	6.9	7.4	5.8	5.4	5.1	6.1
23	6.6	6.3	6.4	6.8	7	6.9	6.8	7.2	5.7	5.2	5.2	6.1
24	6.5	6.4	6.4	6.8	7	7	6.8	7.2	5.6	5.2	5.3	6.1
25	6.3	6.4	6.4	6.8	7	7	6.7	7.1	5.9	5.1	5.6	6
26	6.2	6.4	6.4	6.8	7	7.3	6.8	7.1	6.6	5.3	5.9	5.9
27	6.3	6.4	6.4	6.8	7	7.4	6.8	7.6	5.9	5.4	5.8	5.9
28	6.3	6.7	6.4	6.8	7	7.4	6.8	7.4	5.5	5.2	5.7	5.8
29	6.3	6.4	6.4	6.8	---	7	6.6	6.9	5.5	5.3	5.4	5.8
30	6.3	6.4	6.4	6.8	---	7.1	6.6	6.7	5.3	5.3	5.3	5.8
31	6.3	---	6.4	6.8	---	7.1	---	6.5	---	5.4	5.3	---
TOTAL	192.4	190.3	200.2	202.8	195.2	217.9	210.0	213.5	186.4	163.8	166.7	173.6
MEAN	6.21	6.34	6.46	6.54	6.97	7.03	7	6.89	6.21	5.28	5.38	5.79
AC-FT	382	377	397	402	387	432	417	423	370	325	331	344
MAX	6.6	6.7	6.6	6.8	7	7.4	7.8	7.6	7	5.5	5.9	6.3
MIN	6	6.2	6.4	6.4	6.8	6.8	6.6	6.5	5.3	5.1	5.1	5.3
CAL YR	2008	TOTAL	2287.0	MEAN	6.25	MAX	7.4	MIN	5.3	AC-FT	4540	
WTR YR	2009	TOTAL	2312.8	MEAN	6.34	MAX	7.8	MIN	5.1	AC-FT	4590	

MAX DISCH: 10 CFS AT 17:00 ON Apr. 13,2009 GH 1.35 FT. SHIFT -0.01 FT.

MAX GH: 1.69 FT. AT 12:45 ON Mar. 27,2009 (Ice Affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08230500 CARNERO CREEK NEAR LA GARITA
Water Year 2009

Location.-- Lat. $37^{\circ}51'39''$, Long. $106^{\circ}18'55''$, in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec 28, T.42 N., R.6 E., (projected), UTM X 383930.6, Y 4191071.5, Saguache County, Hydrologic Unit 13010004, on left bank 5.5 miles downstream from the North Fork and 4 miles northwest of La Garita, CO.

Drainage and Period of Record.-- 117 mi 2 .

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a 42 inch diameter metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. On Aug. 28, 2009, the gage was reset on a new 36" concrete well with new inlets at the same datum.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for the following periods: Dec. 4-9, 2008 when ice in well was affecting floats; Dec. 10, 2008 to Mar. 18, 2009 when station was closed for the winter and Aug. 28, 2009 when the gage was being reset. Stage-discharge relation was affected by ice Nov. 18-30, December 1-3, 2008, Mar. 27-31, and Apr. 2, 5, 6, 2009. There were no instrumentation corrections made to the shaft encoder during the year. There were several small flush corrections that were generally prorated from the previous point of inflection on the GH graph.

Datum Corrections.-- Levels were run to the reference point (RP) inside the gage on July 17, 2009 using B.M. 2 as base. The gage RP was within the allowable limit, so no correction was made. Levels were also ran on August 28, 2009 when the gage was reset to establish the new reference point elevation and to establish two new bench marks and re-establish BM# 1. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Control is a concrete, broad-crested weir about 25 feet downstream from the gage. Stream banks affect flow at higher stages. Minor shifting occurs as a result of scour and fill just above the gage. Rating No. 15 was used again this year. It is well-defined over the range of discharges encountered during the water year. Seventeen discharge measurements (Nos. 137-153) were made during the water year, ranging in discharge from 1.57 to 44.6 cfs. They covered the discharge range experienced for the water year. The peak flow of 46 cfs occurred at 11:15 on June 3, 2009 at a gage-height of 2.61 ft. with a shift of +0.04 ft. It occurred as measurement No. 147 was being made. During gage construction the gage pool was cleaned out and approach conditions were straightened. These changes brought shifts back to Rating No. 15 for the remaining portion of the water year.

Discharge.-- Shifting-control method was used for all periods of good record. A shift curve (CARLAGVS0901) was used from Oct. 1 through Dec. 10, 2008 to distribute shifts according to stage. Measurements show shifts varied from 0 to +0.05 feet. All were given full weight and applied except for Nos. 138, 145, 148, 150 and 153 which were adjusted by as much as 7% to smooth shift distribution.

Special Computations.-- Discharge was estimated for periods of no gage-height and ice affected record based on seven discharge measurements, weather records, and comparison with streamflow data of nearby stations. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height, and ice-affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08230500 CARNERO CREEK NEAR LA GARITA

RATING TABLE--

CARLAGCO15 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.8	3.5	3.4	2.4	2.6	2.8	3.6	19	24	8.5	5.6	3
2	2.8	3.5	3.2	2.6	2.6	3	4	20	31	8.7	4.2	2.8
3	2.8	3.7	3	2.6	2.6	3.4	4.4	20	39	9.9	3.6	2.5
4	3	3.6	2.6	2.6	2.6	3.8	4.4	19	39	10	3.6	2.5
5	3.3	3.5	2.5	2.6	2.6	3.6	4.2	19	35	8.7	3.4	2.2
6	3.8	1.9	2.6	2.6	2.6	3.6	4.2	19	32	8	3.5	2.6
7	3.7	2.3	2.8	2.8	2.6	3.4	6.1	21	28	8.4	3.4	2.9
8	3.4	3.4	3	2.8	2.6	3.4	9.5	22	27	7.5	2.9	2.7
9	3.3	3.5	2.8	2.8	2.6	3.5	10	22	26	6.1	2.6	3
10	3.2	3.6	2.4	2.6	2.6	3.6	8.1	22	25	5.8	2.5	2.9
11	3.2	5.1	2.2	2.6	2.4	3.6	9.1	22	25	5.9	2.5	2.9
12	5.5	3.8	2.2	2.6	2.4	3.7	6.5	23	23	5.9	2.4	2.8
13	4.6	3.8	2.2	2.8	2.4	3.6	6.4	21	22	7.4	2.4	3.2
14	4	3.6	2.1	2.8	2.4	3.4	8.1	21	20	7.8	3.1	3.8
15	3.9	2.3	2	2.6	2.4	3.6	7	20	19	6.1	4.2	4.3
16	3.8	2.8	2	2.6	2.4	3.8	9	19	18	5.2	3.4	3.8
17	3.8	3.4	2.4	2.6	2.5	4	7.4	19	17	4.6	2.7	5.3
18	3.7	3.2	2.4	2.4	2.5	4.4	6.9	18	15	4.1	2.5	3.9
19	3.6	3	2.2	2.4	2.6	5.3	9.3	17	14	3.9	2.5	3.2
20	3.6	2.8	2	2.4	2.6	6.7	12	18	14	4	2.3	3.2
21	3.6	2.5	2	2.4	2.8	7.2	17	18	14	4	2.2	3.3
22	3.4	2.2	2.2	2.6	2.8	8.2	19	26	13	5	2.1	3.5
23	2.6	2.2	2.4	2.8	3	8.5	16	23	11	4.5	2.5	3.4
24	2.8	2.2	2.4	2.8	3	5.3	17	22	12	3.9	3	3.6
25	3.5	2	2.4	2.6	2.8	5.2	17	23	13	3.6	4.1	3.8
26	4	2.1	2.4	2.6	2.6	3.9	16	22	13	4.6	5.1	3.6
27	3.4	2.2	2.2	2.5	2.6	3.6	14	27	13	5.6	3.5	3.4
28	3.3	2.3	2.2	2.4	2.6	3.4	15	23	11	4.4	2.9	3.1
29	3.2	2.6	2.4	2.2	---	3.4	16	23	10	3.8	2.3	2.9
30	3.3	3	2.4	2.4	---	3.5	17	23	9	3.8	2.2	3
31	3.4	---	2.4	2.6	---	3.5	---	24	---	4.1	2.6	---
TOTAL	108.3	89.6	75.4	80.1	72.8	131.9	304.2	655	612.0	183.8	95.8	97.1
MEAN	3.49	2.99	2.43	2.58	2.6	4.25	10.1	21.1	20.4	5.93	3.09	3.24
AC-FT	215	178	150	159	144	262	603	1300	1210	365	190	193
MAX	5.5	5.1	3.4	2.8	3	8.5	19	27	39	10	5.6	5.3
MIN	2.6	1.9	2	2.2	2.4	2.8	3.6	17	9	3.6	2.1	2.2

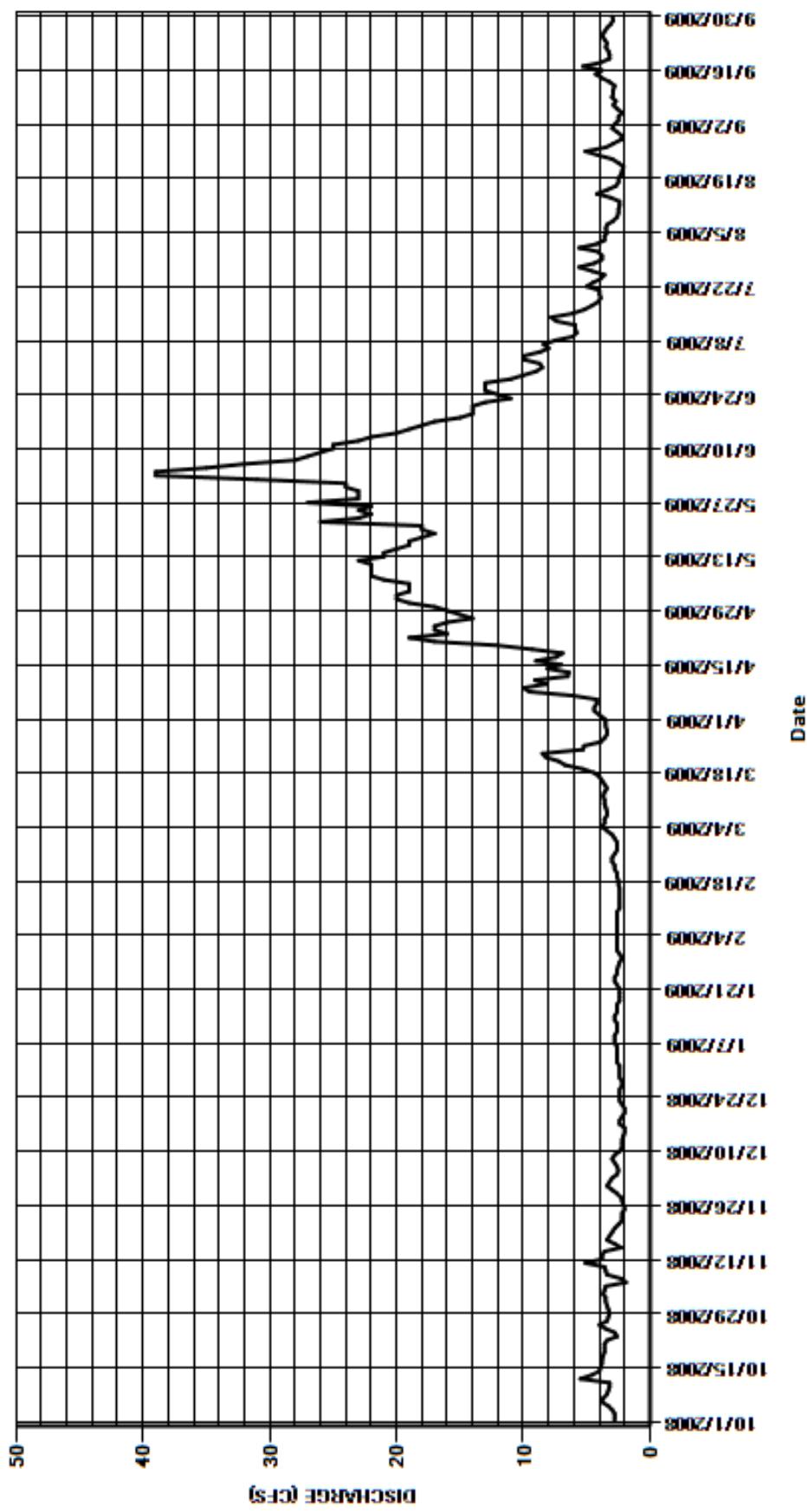
CAL YR	2008	TOTAL	3007.8	MEAN	8.22	MAX	35	MIN	1.9	AC-FT	5970
WTR YR	2009	TOTAL	2506.0	MEAN	6.87	MAX	39	MIN	1.9	AC-FT	4970

MAX DISCH: 46 CFS AT 11:15 ON Jun 03,2009 GH 2.61 FT. SHIFT 0.04 FT.

MAX GH: 2.61 FT. AT 11:15 ON Jun 03,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08230500 CARNERO CREEK NEAR LA GARITA
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08231000 LA GARITA CREEK NEAR LA GARITA
Water Year 2009

Location.-- Lat. $37^{\circ}48'48''$, Long. $106^{\circ}19'05''$, UTM X 383931.1, Y 4185923.3, in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, T.41 N., R.6 E., Saguache County, Hydrologic Unit 13010004, on right bank 4.5 mi. downstream from Little La Garita Creek and 4.5 mi. southwest of La Garita, Co.

Drainage and Period of Record.-- 61 mi 2 . Non-recording station Apr. 01, 1919-June 23, 1927. Recording station from June 1927-Oct. 1998, at which time a Data Logger was installed. April 1999 satellite telemetry system installed. Station at various sites all within $\frac{1}{4}$ mile of present site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping bucket rain gage in a 4 ft. corrugated metal pipe shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. On September 11, 2009 the shelter was reset a few feet upstream on a new concrete well with new inlets at the same datum. The control was also rebuilt with large rocks as a weir structure. Two new bench marks were installed and established.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 8 and 9, 2008 when the floats were affected by ice in well; and Dec. 10, 2008 to Mar. 18, 2009 when the station was closed for the winter; and September 10, 11, 2009 when the gage was being relocated. Stage-discharge relation was affected by ice Nov. 6, 7, 11, 12, 15, 16, 22-26, 28-30, Dec. 1-7, 2008 and Mar. 27, 28, 31, Apr. 5 and 6, 2009. There were no instrumentation corrections made to the shaft encoder during the year.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on July 17, 2009, using B.M. No. 1 as base. The RP was within allowable limits, so no correction was required or made. Levels were also run on Sep. 11, 2009 when the gage was reset to establish the new reference point elevation and to establish two new bench marks. The PZF on the new control was established at 1.184 ft. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- The control was a broad-crested weir approximately 3 feet below the gage until Sep. 11, 2009 when it was rebuilt with boulders as a rock weir structure. Minor shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating No. 12, in use since October 1, 1980, was used again this year. Eighteen discharge measurements (209-226) were made this year, ranging from 2.10 to 43.6 cfs. Measurement No. 218 was not used, but a check Measurement, No. 219 was made immediately. The measurements cover the range experienced except for the higher daily flows on April 29, 30, May 1, 2, 7-9, 22, 2009. The peak flow of 112 cfs occurred at 16:15 on July 26, 2009 at a gage-height of 3.10 feet with a shift of -0.06 feet. It exceeded high measurement No. 219 (GH = 2.74), made May 12, 2009 by 0.36 feet in stage.

Discharge.-- Shifting control method was used for all open water periods. Three variable shift curves were used to distribute shifts according to gage height. LAGLAGVS0901 was used from March 18, until May 12, 2009. LAGLAGVS0902 was used from May 12 until September 11, 2009, when the gage was reset and a new control installed. LAGLAGVS0903 was used from Sep. 11 to Sep. 30, 2009. The measurements before resetting the gage show shifts varied from -0.07 and +0.08 feet, and varied from +0.40 to +0.42 after the gage was reset. The measurements (227-229) made the early part of WY2010 were included in the shift curve LAGLAGVS0903. All open water measurements were given full weight and applied except Nos. 218, not used, 220, 222, and 223 which were adjusted by as much as 5% to smooth the shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice-affected record were estimated using seven discharge measurements, comparison with nearby stations, and weather records. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height and ice-affected record, which should be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08231000 LA GARITA CREEK NEAR LA GARITA

RATING TABLE-- LAGLAGCO12 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.4	4.2	6	3	3.2	6.2	5.2	49	33	12	5.7	3.4
2	4	4.3	5.6	3	3.2	7	4.9	46	34	12	4.5	3.3
3	3.8	4.4	5.2	3	3.4	7.4	5.7	33	37	12	4.4	2.9
4	3.8	4.3	4.6	3	3.4	7.6	5.3	29	40	11	4.5	3
5	4	4.3	5	3	3.6	7.6	4.5	30	35	12	4.2	3
6	4.9	2.8	5	3.2	3.6	7.4	4.3	34	32	13	4.7	3.3
7	4.6	2.4	4.6	3.2	3.6	7.2	6.2	46	30	14	4	3.2
8	4.2	2.6	3.8	3	3.6	7.2	10	50	30	9.8	3.4	2.8
9	4	4.6	3.8	3	3.8	7.2	12	45	28	8.3	3.1	3.2
10	3.8	4.9	3.4	2.8	3.8	7	9.6	42	28	7.8	2.9	3.2
11	4	4.6	3.2	2.8	3.8	6.8	14	39	27	8.7	2.9	3.4
12	7.6	4.4	3	3	3.6	6.6	9.6	40	25	8.1	2.8	3.1
13	5.4	4.5	3	3.2	3.6	6.6	9.5	41	23	7.6	2.7	3.8
14	5.8	4.7	2.6	3.2	3.4	6.6	9.4	39	22	7.8	4.1	4.1
15	5	4.8	2.4	3	3.4	6.6	7.9	36	21	6.8	4.9	4
16	4.9	4.8	2.6	3	3.6	6.6	7.8	35	19	6.5	3.4	3.9
17	4.8	4.8	2.8	3	3.6	6.8	7.6	33	18	5.6	3.1	4.2
18	4.8	4.3	3	3	3.8	7	7.3	32	18	5.1	2.8	4
19	4.6	3.9	2.8	3	3.8	6.8	8.5	31	17	4.9	2.7	3.6
20	4.6	3.5	2.8	3	4	7.8	9.6	30	17	5.3	2.4	3.7
21	4.6	3.1	2.8	3	4.2	7.9	14	31	17	5.2	2.3	3.9
22	4.1	3	3	3.2	4.4	9.3	18	45	16	6.3	2.2	4.1
23	2.6	3.4	3	3.4	4.8	9.2	21	39	14	5.4	2.5	4
24	3.2	3.6	2.8	3.4	5.4	5.6	22	44	15	4.6	3	4.1
25	4.8	3.6	2.8	3.4	6	6.2	32	38	14	4.3	5.6	4.1
26	5.5	3.8	3	3.4	6.2	5.7	32	34	16	14	4.5	4.1
27	4.4	3.9	2.8	3.2	6.2	6	32	37	15	8.4	3.1	4
28	4.3	4.5	2.6	3	5.8	6.5	36	34	14	5.9	2.8	3.4
29	4.1	5.4	2.6	3	---	5.3	50	36	13	5.3	2.6	3.3
30	4.1	6.4	2.6	3	---	6.2	53	34	12	5.4	2.7	3.4
31	4.3	---	2.8	3	---	4.8	---	32	---	5.2	3.4	---
TOTAL	138.0	123.8	106.0	95.4	114.8	212.7	468.9	1164	680	248.3	107.9	107.5
MEAN	4.45	4.13	3.42	3.08	4.1	6.86	15.6	37.5	22.7	8.01	3.48	3.58
AC-FT	274	246	210	189	228	422	930	2310	1350	493	214	213
MAX	7.6	6.4	6	3.4	6.2	9.3	53	50	40	14	5.7	4.2
MIN	2.6	2.4	2.4	2.8	3.2	4.8	4.3	29	12	4.3	2.2	2.8

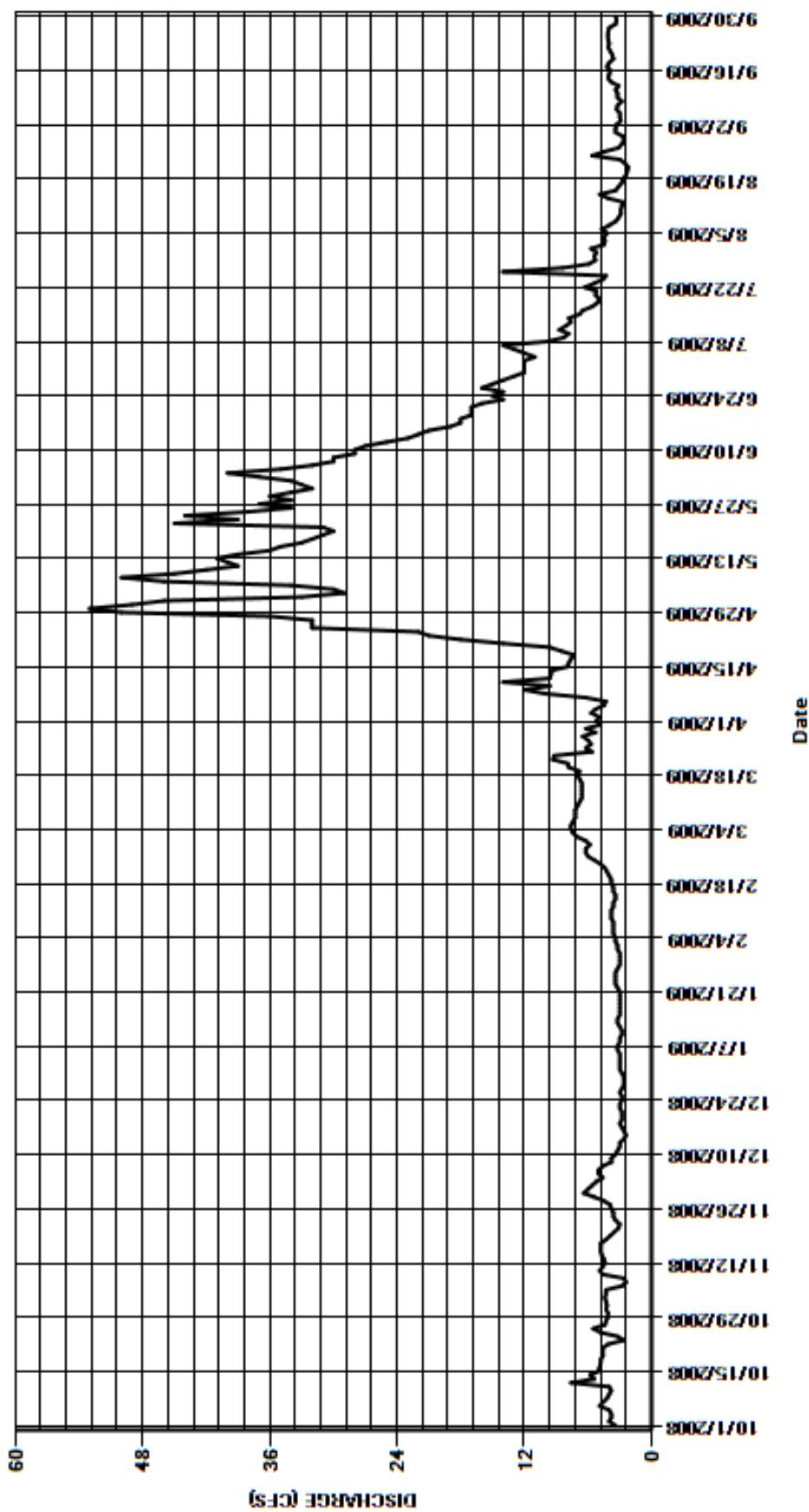
CAL YR	2008	TOTAL	3538.5	MEAN	9.67	MAX	48	MIN	2.4	AC-FT	7020
WTR YR	2009	TOTAL	3567.3	MEAN	9.77	MAX	53	MIN	2.2	AC-FT	7080

MAX DISCH: 112 CFS AT 16:15 ON Jul. 26,2009 GH 3.1 FT. SHIFT -0.06 FT.

MAX GH: 3.1 FT. AT 16:15 ON Jul. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08231000 LA GARITA CREEK NEAR LA GARITA
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
Water Year 2009

Location.-- Lat 37°24'09", long 106°31'17", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec.35, T.37 N., R.4 E., Rio Grande Co. Hydrologic Unit 13010002, Rio Grande National Forest, on left bank 150' upstream from Wightman Fork, 1.9 mi downstream from Bitter Creek, 4.1 mi west of Jasper, and 4.2 mi southeast of Summitville.

Drainage and Period of Record.-- 37.8 mi².

Equipment.-- Shelter is 4'x 4'x 8' foot steel building. Gage-height is collected using a Sutron Accubar pressure transducer. A Hydrolab instrument collects water temperature, conductance, and pH. Satellite monitoring data collection platform is used to collect, store and transmit data. Primary reference gage is an outside staff gage. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete for period of operation, Oct. 1 to Nov. 11, 2008 and May 2 to Sep. 30, 2008, except for Nov. 11, 2008 and May 2, 2009 (shutdown and startup days) when there was missing satellite data, and Jul. 14 through Sep. 30, 2009 when gage was isolated from stream. Gage height was affected by ice November 6-10, 2008.

Datum Corrections.-- Levels were not run at this station this year.

Rating.-- Control is the channel with rock bottom and alluvial banks. Control and stream are covered by ice during winter. Rating No. 5 was used for this year's period of record. Eight discharge measurements (Nos. 41-48) were made during the period of record. The measurements ranged in discharge from 9.37 to 412 cfs. Five measurements (Nos. 41-45) were made prior to the gage becoming isolated. Measurements covered the discharge range encountered, except for higher mean daily flows on May 7-21, 2009 and the lower estimated daily flows of Nov. 7-11, 2008. The maximum gage-height of 5.24 ft. (GH correction of -0.34 ft. applied) occurred at 21:00 on May 7, 2009. The peak flow of 1070 cfs occurred at 18:45 on May 10, 2009 at a gage-height of 5.23 ft. (GH correction of -0.34 ft. applied) with a shift of +0.13 ft. It exceeded high measurement No. 43 (GH = 4.36 ft) made May 22, 2009, by 0.87 feet in stage.

Discharge.-- Shifting control method was used during the entire period of record. Measured and applied shifts ranged from -0.29 to +0.40 ft. Shifts were applied as defined by measurements and distributed by time. All were given full weight and applied.

Special Computations.-- Discharge for periods of missing record was based on weather records, partial stage records, records for nearby stations, Wightman Fork at Mouth near Jasper, Alamosa River below Ranger Creek, and discharge measurements. A hydrograph was used.

Remarks.-- Due to the apparent inability of the pressure transducer installation to consistently and accurately track stream stage (painting, trash hanging up on the installation, unexplained pressure transducer corrections) and the instability of the channel and control, the record is rated fair. Periods of missing gage-height, including Jul. 14 to Sep. 30, when the gage was isolated, are rated poor. Due to uncertainty in the upper end of rating curve and distribution of a large trash correction, the periods of May 7-22, 2009, including peak gage-height and flow information are also considered poor. After the high flows at this site in May and June 2008 a large amount of material was deposited in control section causing the stream to be split into two channels. During the high water of May and June 2009 more material was deposited in the main, left hand, channel. During the same period the right hand channel was being scoured out, when the high water receded all the flow was in the left hand channel, leaving the pressure transducer, and Hydrolab equipment isolated from the stream. This gage has been moved upstream to a better site for the spring of 2010 water year. Station maintained and record developed by private consultant; record reviewed by Div III personnel.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER

RATING TABLE--

ALAWIGCO05 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

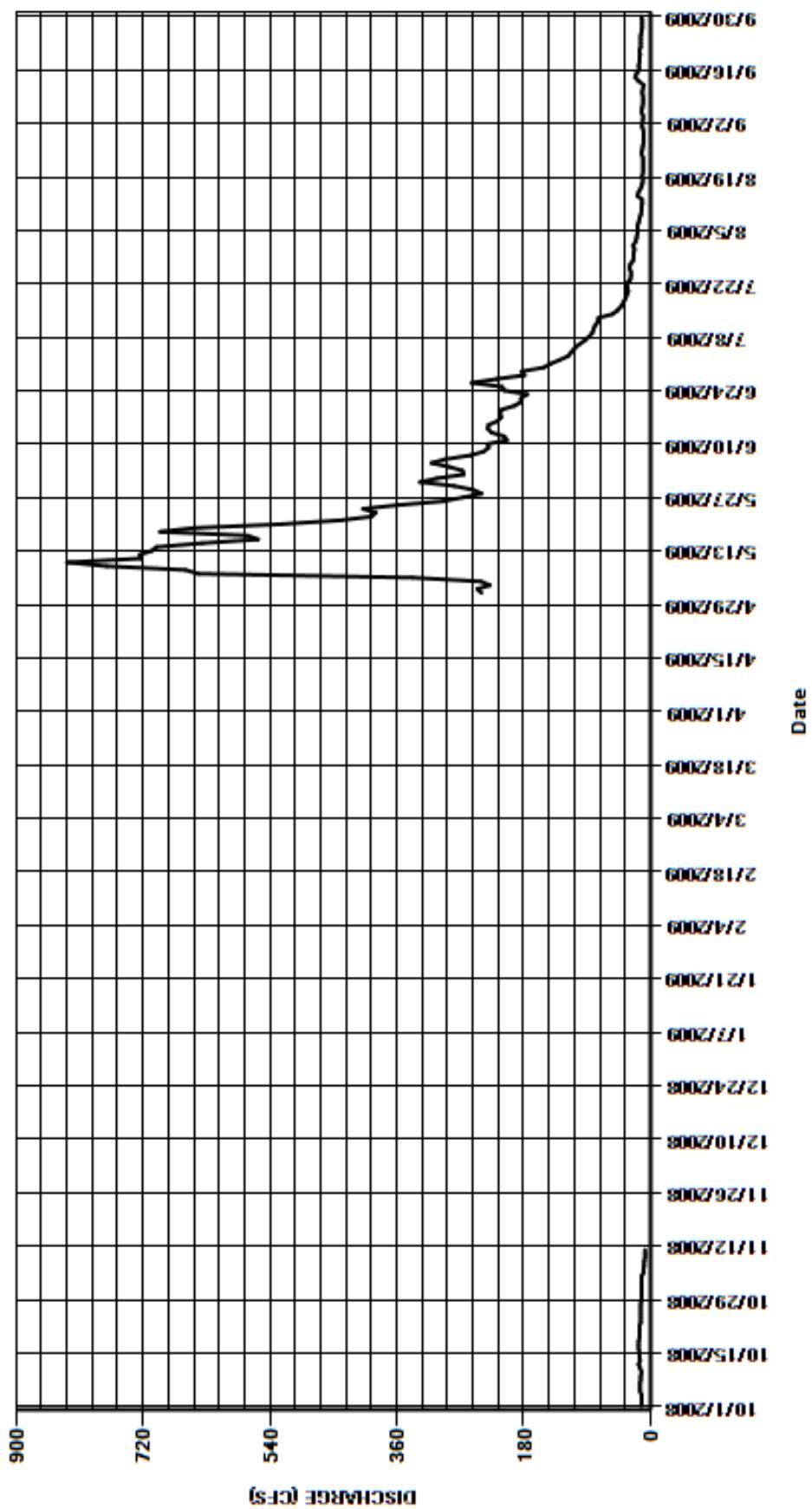
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	13	---	---	---	---	---	---	303	142	25	12
2	13	13	---	---	---	---	---	240	265	129	21	12
3	13	13	---	---	---	---	---	246	267	117	20	11
4	13	13	---	---	---	---	---	228	286	113	19	11
5	15	10	---	---	---	---	---	241	311	108	18	13
6	15	10	---	---	---	---	---	338	291	102	19	12
7	15	9	---	---	---	---	---	642	256	94	17	11
8	14	9	---	---	---	---	---	660	237	88	16	11
9	14	8	---	---	---	---	---	772	230	83	14	11
10	13	8	---	---	---	---	---	828	231	81	13	12
11	15	8	---	---	---	---	---	723	204	79	13	11
12	17	---	---	---	---	---	---	725	208	75	12	10
13	15	---	---	---	---	---	---	708	226	74	12	17
14	16	---	---	---	---	---	---	701	231	54	19	22
15	16	---	---	---	---	---	---	637	230	47	17	20
16	17	---	---	---	---	---	---	557	217	42	14	16
17	17	---	---	---	---	---	---	572	212	39	12	17
18	17	---	---	---	---	---	---	696	214	36	11	16
19	16	---	---	---	---	---	---	648	211	34	12	16
20	16	---	---	---	---	---	---	524	193	32	11	15
21	16	---	---	---	---	---	---	440	184	33	11	16
22	16	---	---	---	---	---	---	396	184	34	11	14
23	14	---	---	---	---	---	---	390	175	29	11	14
24	14	---	---	---	---	---	---	408	208	28	11	14
25	14	---	---	---	---	---	---	358	211	28	13	14
26	14	---	---	---	---	---	---	294	254	30	12	13
27	14	---	---	---	---	---	---	266	218	29	11	12
28	14	---	---	---	---	---	---	240	179	25	10	12
29	13	---	---	---	---	---	---	252	183	24	10	12
30	13	---	---	---	---	---	---	279	152	24	10	13
31	13	---	---	---	---	---	---	327	---	23	10	---
TOTAL	455	114.0	---	---	---	---	---	14336	6771	1876	435	410
MEAN	14.7	10.4	---	---	---	---	---	478	226	60.5	14	13.7
AC-FT	902	226	---	---	---	---	---	28440	13430	3720	863	813
MAX	17	13	---	---	---	---	---	828	311	142	25	22
MIN	13	8	---	---	---	---	---	228	152	23	10	10
CAL YR	2008	TOTAL	23970.0	MEAN	124	MAX	696	MIN	8	AC-FT	47540	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	24397.0	MEAN	126	MAX	828	MIN	8	AC-FT	48390	(PARTIAL YEAR RECORD)

MAX DISCH: 1070 CFS AT 18:45 ON May. 10,2009 GH 5.23 FT. SHIFT 0.13 FT. (GH CORR. -0.34 APPLIED)

MAX GH: 5.24 FT. AT 21:00 ON May. 07,2009 (GH CORR. -0.34 APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE
Water Year 2009

Location.-- Lat. $37^{\circ}25'45''$, Long. $106^{\circ}35'03''$, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, T.37N., R.4 E., Rio Grande Co., Hydrologic Unit 13010002, on left bank about 200 ft. downstream from Cropsy Creek, and 0.25 mi east of Summitville.

Drainage and Period of Record.-- 4.44 mi². July 1995 to current year (seasonal records only).

Equipment.-- The primary record is generated by an electronic data logger (Sutron 8200) with satellite transmitter, which records gage-height data from a Sutron Accubar bubbler gage in a 4 ft. by 4 ft. by 8 ft. steel building. The primary reference gage is an outside staff gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete for period of operation, October 1 to November 11, 2008 and May 3 to September 30, 2009, except for November 11, 2008 and May 3, 2009 when there was missing data; and Aug. 7, 10, 11, 2009 when bubbler orifice was temporarily plugging. Stage discharge relation was affected by ice October 13, 15-17, 22-25, Nov. 5-10, 2008, and May 4-6, 2009. There were three instrument corrections made to the Accubar ranging from -0.02 to -0.06 feet. These corrections were prorated from previous visit. A correction of -0.27 feet made on May 25, 2009 was due to setting Accubar wrong on May 3, 2009 and was applied from that point. A -0.35 foot correction was applied Jun. 26-28, since chart observation indicated an unnatural ~0.35 ft rise then a correlating fall.

Datum Corrections.-- No levels were run this year.

Rating.-- Control is small, low rock and log dam. Channel is also part of the control. The control is subject to change from high water and excavations in the channel upstream. Control and stream ice up during the winter. Rating No. 5 was used from Oct. 1 through Nov. 11, 2008 and from May 3, through July 3, 2009 when the gage pool was cleaned out. Rating No. 5-1 was developed by redefining the lower end of No. 5 below gage-height of 4.30 feet using measurements made after the gage pool was cleaned out. This rating was used from July 3, 2009 through the remainder of the period of record. Eight measurements (Nos. 36-43) were made this year ranging in discharge from 2.96 to 33.9 cfs. Measurements cover the discharge range experienced except for the lower mean daily flows of Oct. 1-24, 28, 29, Nov. 2-11, 2008, and Aug. 8-10, 16 -31, Sep. 1-12, 14-30, 2009 and the higher daily flows of May 6-24, 31, 2009. The maximum gage height of the period of record was 9.12 ft (ice affected) on Oct. 23, 2008. The peak flow of 104 cfs occurred at 21:15 on May 7, 2009 at a gage-height of 5.67 ft (GH correction of -0.27 ft applied) with a shift of -0.01 ft. It exceeded high measurement No. 38 (GH = 4.98), made May 25, 2009, by 0.69 ft. in stage.

Discharge.-- Shifting control method was used for all periods of record. A variable shift curve was used to distribute shifts according to stage from Oct. 1 to Nov. 11, 2008. During other periods, shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied from -0.41 to 0.05 feet during the water year. All measurements were given full weight and applied except for No. 37, which was not used.

Special Computations.-- Discharges were compared to those for station 'Wightman Fork at Mouth.'

Remarks.-- The plotted gage-height record indicates that the Accubar pressure sensor continuously 'hunts' the point of pressure equilibrium. This hunting creates some uncertainty in gage-height record. These fluctuations significantly increase when silt and debris is deposited on and around the orifice. A sensitivity analyses indicated that periods of greater fluctuations should be rated poor. Therefore, record is fair, except for periods of increased fluctuations including May 20 to Jun. 28, Aug. 5-18, Aug. 27 to Sep. 13, which are poor; and periods of missing gage-height and ice affected record which are poor. Maximum discharge value and days with a corrected average daily gage height greater than 4.98 ft (May 7-24, 2009) should also be considered poor due uncertainty of shifts above that gage height. Due to uncertainty in determining the actual PZF to use in the shift curve, the accuracy of the low flow period of Oct. 1 through Nov. 10, 2008 should also be considered poor. Station maintained and record developed by private consultant; record reviewed by Div III personnel.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE

RATING TABLE--

WFKCROCO05 USED FROM 01-Oct-2008 TO 03-Jul-2009
WFKCROCO05-1 USED FROM 03-Jul-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

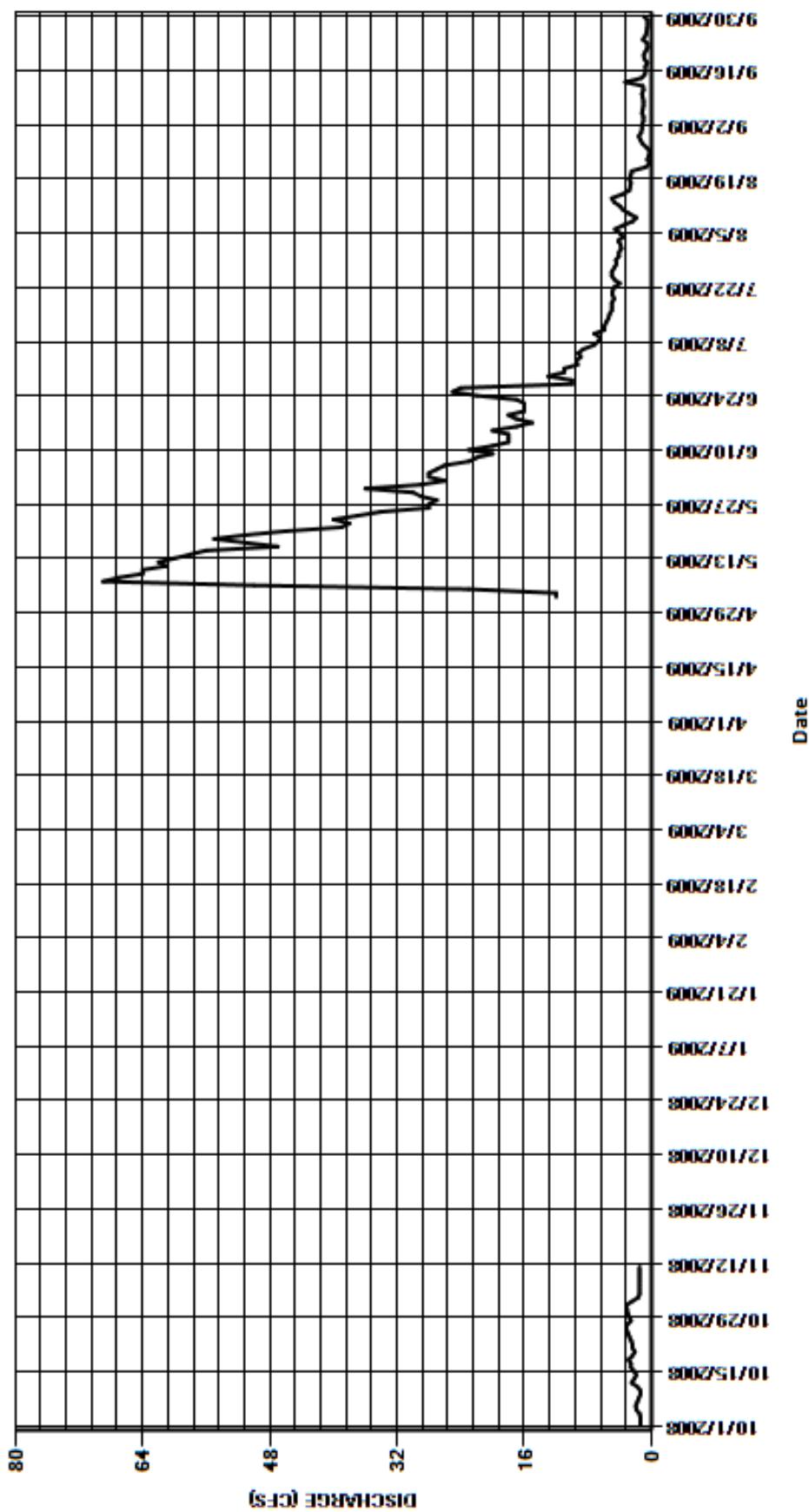
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	3.2	--	--	--	--	--	--	29	11	3.8	1.2
2	1.4	2.5	--	--	--	--	--	--	26	9.3	3.9	1.2
3	1.4	1.7	--	--	--	--	--	12	28	9.5	4.2	1
4	1.5	1.5	--	--	--	--	--	12	28	8.9	3.6	1
5	1.9	1.5	--	--	--	--	--	23	27	9.2	4	1.2
6	2	1.5	--	--	--	--	--	50	26	8.6	4.6	1.1
7	1.8	1.5	--	--	--	--	--	69	23	7.3	3.6	1
8	1.6	1.5	--	--	--	--	--	67	22	6.7	2.4	1
9	1.4	1.5	--	--	--	--	--	64	20	6.4	1.9	1.1
10	1.4	1.5	--	--	--	--	--	64	23	7.2	2.8	1.2
11	1.8	1.5	--	--	--	--	--	61	20	5.9	3.6	1
12	2.5	--	--	--	--	--	--	62	18	5.9	4	1.1
13	2.2	--	--	--	--	--	--	60	18	5.7	4.7	3.3
14	1.9	--	--	--	--	--	--	58	18	5.4	5	1.3
15	2.2	--	--	--	--	--	--	56	20	5.3	3.7	0.83
16	2.6	--	--	--	--	--	--	47	17	5	2.8	0.75
17	2.6	--	--	--	--	--	--	51	15	5	2.7	0.77
18	2.9	--	--	--	--	--	--	55	17	5	2.6	0.55
19	2.4	--	--	--	--	--	--	51	18	4.7	2.8	0.91
20	2.1	--	--	--	--	--	--	46	16	4.9	2.6	0.99
21	2.4	--	--	--	--	--	--	39	16	4.9	2.5	0.74
22	2.4	--	--	--	--	--	--	38	16	4.7	0.76	0.48
23	2.6	--	--	--	--	--	--	40	17	4	0.19	0.54
24	2.8	--	--	--	--	--	--	37	22	4.7	0.52	1.1
25	3	--	--	--	--	--	--	34	25	5	0.34	0.75
26	3.2	--	--	--	--	--	--	28	24	5	0.21	0.62
27	3.1	--	--	--	--	--	--	28	10	4.7	0.56	0.55
28	2.6	--	--	--	--	--	--	27	10	4.4	1.1	0.48
29	2.8	--	--	--	--	--	--	29	13	4.5	1.4	0.48
30	3	--	--	--	--	--	--	30	11	4.1	1.6	0.98
31	3.1	--	--	--	--	--	--	36	---	4.1	1.3	---
TOTAL	70.0	19.4	--	--	--	--	--	1274	593	187.0	79.78	29.22
MEAN	2.26	1.76	--	--	--	--	--	43.9	19.8	6.03	2.57	0.97
AC-FT	139	38	--	--	--	--	--	2530	1180	371	158	58
MAX	3.2	3.2	--	--	--	--	--	69	29	11	5	3.3
MIN	1.4	1.5	--	--	--	--	--	12	10	4	0.19	0.48

CAL YR	2008	TOTAL	2383.7	MEAN	12.4	MAX	82	MIN	1.2	AC-FT	4730	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	2252.40	MEAN	11.7	MAX	69	MIN	0.19	AC-FT	4470	(PARTIAL YEAR RECORD)

MAX DISCH: 104 CFS AT 21:15 ON May. 07,2009 GH 5.67 FT. SHIFT -0.01 FT. (GH CORR. -0.27 FT. APPLIED)
MAX GH: 9.12 FT. AT 01:00 ON Oct. 23,2008 (Ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER
Water Year 2009

Location.-- Lat. $37^{\circ}24'14''$, Long. $106^{\circ}31'16''$, in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, T.37 N., R.4 E., Rio Grande County, Hydrologic Unit 13010002, on right bank 25' downstream from bridge on Forest Development Road No. 250, about 300' upstream from confluence with Alamosa River, and 4.3 mi southwest of Jasper.

Drainage and Period of Record.-- 16.1 mi². July 1995 to current year (seasonal record only).

Equipment.-- Shelter is 4x4x8 foot steel building. Shelter also houses equipment for station 'Alamosa River above Wightman Fork.' Contact with stream to determine water levels is by use of Sutron Accubar. Equipment includes Hydrolab to obtain water quality information. Data is stored in data collection platform (DCP) and transmitted by satellite. The primary reference gage is an outside staff gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete for the period of operation, Oct. 1 - Nov. 11, 2008 and May 2 to Sep. 30, 2009, except for Nov. 11, 2008 and May 2, 2009 when there was missing satellite data. Gage-height was affected by ice Oct. 22-25, Nov. 5-10, 2008. The Accubar was reading 0.09 ft. too high on Jun. 13 due to silt covering the orifice, so a -0.09 ft correction was prorated from previous visit. There were two instrument corrections made to the Accubar pressure sensor. A -0.05 ft. correction on Jul. 25, assumed due to silt covering the orifice, was prorated from previous visit; and a offsetting +0.05 ft. correction on Aug. 22 after an instantaneous ~0.05 ft. drop in GH on Jul. 28, 2009. It was assumed that the silt was either manually or naturally cleared at this point and the correction was distributed from there.

Datum Corrections.-- No levels were run this water year.

Rating.-- Control is stream channel and stream banks. Control is fairly stable, but ices up in winter. Rating No. 6 used for this year's period of record. Eight discharge measurements (Nos. 50-57) were made during period of record for this water year ranging in discharge from 3.0 to 118 cfs. Measurements covered the range encountered except for the higher daily flows on May 5-20, 2009 and the lower daily flows on Oct. 1-4, 9, 10, 2008, Aug. 23-31, Sep. 1-12, 18-24, 26-30, 2009. The peak flow of 485 cfs occurred at 19:45 on May 11, 2009 at a gage-height of 5.22 feet with a shift of -0.19 feet. It exceeded high measurement No. 52 (GH=4.54 ft.), made May 22, 2009 by 0.68 feet in stage.

Discharge.-- Shifting-control method was used for all periods of record. A shift curve was used from May 22 to Sep. 13, 2009 to apply shifts according to stage. During other periods, shifts were applied as defined by measurements and distributed by time. Measurements show shifts ranging from -0.02 to +0.22 feet. All were given full weight and applied except Nos. 53, 55, and 57 which were adjusted as much as 5% to smooth shift distribution.

Special Computations.-- A hydrograph was used; comparison was made with the flows of this station and the station 'Wightman Fork below Cropsy Creek.'

Remarks.-- The plotted gage-height record indicates that the Accubar pressure sensor fluctuations are minimal as long as the orifice is free of silt and debris. There was a significant change in control during the period of May 2-22, 2009. Due to uncertainty in shift distribution and an approximate -0.20 ft. bubbler self correction on May 19, this period should be rated fair, except for May 6-15, 2009, when mean daily discharge is near or greater than 150% of highest measured flow, including peak discharge, which should be considered poor. The remaining period of record is good, except for periods of missing gage-height and ice affected record, which are poor. Station maintained and record developed by private consultant; record reviewed by Div III personnel.

Recommendations.-- A site visit log should be maintained at these stations to indicate conditions, changes, or corrections during visits when a discharge measurement is not made.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER

RATING TABLE--

WFKMOUC006 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.6	4.6	---	---	---	---	---	---	68	25	5.6	1.9
2	2.5	4.5	---	---	---	---	---	88	57	24	5.4	2
3	2.4	4	---	---	---	---	---	88	59	23	6.2	1.9
4	2.8	3.3	---	---	---	---	---	92	61	20	5.6	1.9
5	3.9	3.3	---	---	---	---	---	129	59	19	5.3	2.1
6	4.4	3.2	---	---	---	---	---	184	57	18	5.8	2.1
7	3.9	3	---	---	---	---	---	259	45	16	5	2
8	3.1	3.1	---	---	---	---	---	248	41	14	4.1	1.9
9	2.6	3.2	---	---	---	---	---	180	37	13	3.9	2
10	2.5	3.2	---	---	---	---	---	223	42	13	4.3	2
11	3.9	3.2	---	---	---	---	---	216	37	11	4.6	1.8
12	5.7	---	---	---	---	---	---	237	34	11	4.6	1.8
13	3.7	---	---	---	---	---	---	166	32	11	4.8	4.6
14	4.3	---	---	---	---	---	---	174	33	10	7.2	4.4
15	4.5	---	---	---	---	---	---	192	32	9.2	5.8	4.2
16	5.8	---	---	---	---	---	---	152	29	8.7	5	3
17	6	---	---	---	---	---	---	157	28	8.3	4.7	3.1
18	5.7	---	---	---	---	---	---	161	29	7.8	4.6	2.6
19	4.9	---	---	---	---	---	---	163	27	7.1	4.5	2.6
20	4.1	---	---	---	---	---	---	119	26	7.1	4.4	2.9
21	3.7	---	---	---	---	---	---	112	25	7	4.4	2.8
22	3	---	---	---	---	---	---	112	23	6.9	3.3	2.2
23	3.2	---	---	---	---	---	---	103	23	6.2	2.1	2.2
24	3.2	---	---	---	---	---	---	113	33	6.6	2.4	2.7
25	3.2	---	---	---	---	---	---	107	34	6.6	2.8	3
26	4.5	---	---	---	---	---	---	82	45	6.9	2.3	2.7
27	5.2	---	---	---	---	---	---	68	34	7	2	2.3
28	4.2	---	---	---	---	---	---	61	28	6.1	1.9	2
29	4.4	---	---	---	---	---	---	62	34	6	1.8	1.9
30	4.6	---	---	---	---	---	---	61	27	5.9	2.2	2.8
31	4.6	---	---	---	---	---	---	74	---	5.8	2.2	---
TOTAL	123.1	38.6	---	---	---	---	---	4183	1139	347.2	128.8	75.4
MEAN	3.97	3.51	---	---	---	---	---	139	38	11.2	4.15	2.51
AC-FT	244	77	---	---	---	---	---	8300	2260	689	255	150
MAX	6	4.6	---	---	---	---	---	259	68	25	7.2	4.6
MIN	2.4	3	---	---	---	---	---	61	23	5.8	1.8	1.8

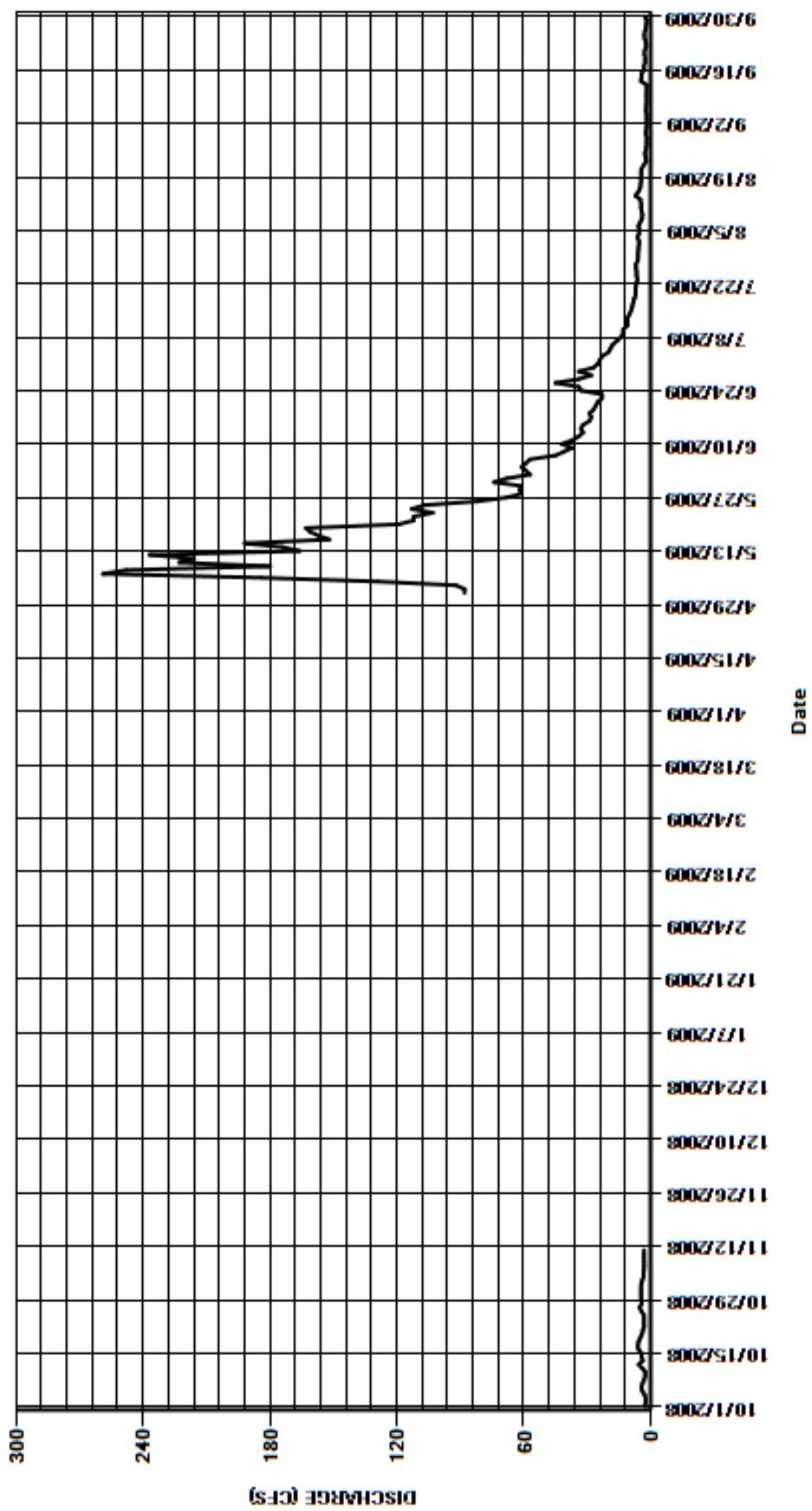
CAL YR	2008	TOTAL	6640.6	MEAN	34.4	MAX	275	MIN	2.1	AC-FT	13170	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	6035.1	MEAN	31.1	MAX	259	MIN	1.8	AC-FT	11970	(PARTIAL YEAR RECORD)

MAX DISCH: 485 CFS AT 19:45 ON May. 11,2009 GH 5.22 FT. SHIFT -0.19 FT.

MAX GH: 5.22 FT. AT 19:45 ON May. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER
Water Year 2009

Location.-- Lat. 37°23'23", Long. 106°22'41", UTM X 378078.0, Y 4138906.2, Conejos County, on right bank, 30' above Silver Lakes Road Bridge, 0.4 miles below Ranger Creek and 4 miles above Terrace Reservoir.

Drainage and Period of Record.-- N/A. Station established in water year 2003.

Equipment.-- Shelter is 4'x4'x8' steel building equipped with Sutron Accubar to collect stream level data and Hydrolab to obtain water quality information. A Sutron 8200 DCP used to store collected data and transmit to satellite. The primary reference gage is an outside staff gage. On Jul. 27, 2009, the DCP was replaced with a Sutron Satlink Logger with HDR GOES radio, and the Accubar was programmed to record 'averaged' gage-heights.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable for the period of operation, Oct. 1 to Nov. 11, 2008 and May 2 to Sep. 30, 2009, except for Nov. 11, 2008, May 2, 2009, when there was missing data. There were two large nearly offsetting pressure transducer corrections on May 13 and May 22, 2009. The +0.20 ft correction on May 13 was made during rapidly rising gage-height and it was assumed caused by bubbler lag. Therefore the distributed correction through this period cancelled out the mis-correction made to the transducer. These corrections were distributed to best-fit flows at Alamosa Creek above Terrace Reservoir, which is approximately 2.5 miles downstream.

Datum Corrections.-- Levels were not run at this station this year.

Rating.-- Control is primarily stream channel of rock and earthen banks. Bridge on downstream side of gage is also part of the control. Channel is stable at low and medium flows, but can change at very high flows. Stream is covered by ice during winter months. Rating No. 5_1 was developed last year and used for this year's period of record. It was developed using recent discharge measurements and the Aquarius rating table development software. Eight discharge measurements (Nos. 52-59) were made during period of record for this water year ranging in discharge from 19.6 to 1210 cfs. Measurements covered the range encountered except for the lower daily flows on Oct. 23, Nov. 5-11, 2008 and Aug. 22-24, 26-31, Sept. 1-4, 6-12, 28, 29, 2009. The peak flow of 1240 cfs occurred at 23:00 on May 11, 2009 at a gage-height of 5.92 feet with a shift of -0.01 feet. It exceeded high measurement No. 54 (GH=5.86 ft.), made May 13, 2009 by 0.06 feet in stage.

Discharge.-- Shifting control method was used during all open water periods. A shift curve (ALARANVSC0901) was used to distribute shifts according to gage-height from Jul. 3 to Sep. 30, 2009. During other periods, shifts were applied as defined by measurements and distributed by time. Measurements show shifts ranging from -0.04 to +0.02 feet. All were given full weight and applied except Nos. 55 and 58 which were adjusted as much as 4% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height was estimated using good record from the Alamosa River above Terrace Reservoir gage station and one measurement. A hydrograph was used.

Remarks.-- There are several issues that create some uncertainty in the gage-height record. The fluctuation of water surface at the staff gage causes difficulty obtaining an accurate stage, especially during high water. The plotted gage-height record indicates that the Accubar pressure sensor continuously 'hunts' the point of pressure equilibrium. This hunting along with the inherent time lag of bubbler type pressure systems creates additional uncertainty in the record. The apparent hunting should be less in the future since the Accubar was set to average. Due to these uncertainties, the record should be considered fair except for periods of no gage-height and ice affected record, which are poor. Comparison of daily max, min, and average flows with the downstream station 'Alamosa above Terrace Reservoir' indicates reasonable correlation during the period from May 3 to May 22, 2009, but due to uncertainty in the distribution of the two large pressure transducer corrections, this period should be considered poor. Station maintained and record developed by private consultant; record reviewed by Div III personnel.

Recommendations.-- The bubble rate on the bubbler system should be increased to decrease the lag time in sensor response during rapid changes in stage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER

RATING TABLE--

ALARANCO05_1 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	23	---	---	---	---	---	---	491	250	41	19
2	24	22	---	---	---	---	---	440	412	227	35	19
3	23	23	---	---	---	---	---	441	406	200	34	17
4	23	23	---	---	---	---	---	418	403	189	32	17
5	28	18	---	---	---	---	---	499	455	176	30	21
6	29	16	---	---	---	---	---	641	439	171	32	19
7	29	14	---	---	---	---	---	856	358	153	29	18
8	27	16	---	---	---	---	---	996	321	134	26	18
9	25	16	---	---	---	---	---	1010	305	122	24	18
10	23	17	---	---	---	---	---	1000	311	114	22	19
11	29	17	---	---	---	---	---	1030	268	108	22	17
12	40	---	---	---	---	---	---	1030	248	99	21	16
13	27	---	---	---	---	---	---	1000	283	91	22	29
14	32	---	---	---	---	---	---	989	293	87	34	35
15	28	---	---	---	---	---	---	943	295	76	30	32
16	33	---	---	---	---	---	---	833	289	69	25	26
17	34	---	---	---	---	---	---	776	279	64	22	27
18	34	---	---	---	---	---	---	856	287	59	21	25
19	32	---	---	---	---	---	---	884	293	56	21	25
20	31	---	---	---	---	---	---	785	282	53	20	24
21	30	---	---	---	---	---	---	725	255	54	20	26
22	23	---	---	---	---	---	---	656	264	55	19	22
23	18	---	---	---	---	---	---	639	258	48	18	22
24	20	---	---	---	---	---	---	673	325	47	18	23
25	21	---	---	---	---	---	---	612	340	46	22	23
26	23	---	---	---	---	---	---	519	434	50	19	21
27	24	---	---	---	---	---	---	462	397	49	17	20
28	23	---	---	---	---	---	---	385	310	42	16	19
29	22	---	---	---	---	---	---	385	327	39	16	19
30	23	---	---	---	---	---	---	432	267	39	17	21
31	22	---	---	---	---	---	---	496	---	37	17	---
TOTAL	825	205	---	---	---	---	---	21411	9895	3004	742	657
MEAN	26.6	18.6	---	---	---	---	---	714	330	96.9	23.9	21.9
AC-FT	1640	407	---	---	---	---	---	42470	19630	5960	1470	1300
MAX	40	23	---	---	---	---	---	1030	491	250	41	35
MIN	18	14	---	---	---	---	---	385	248	37	16	16

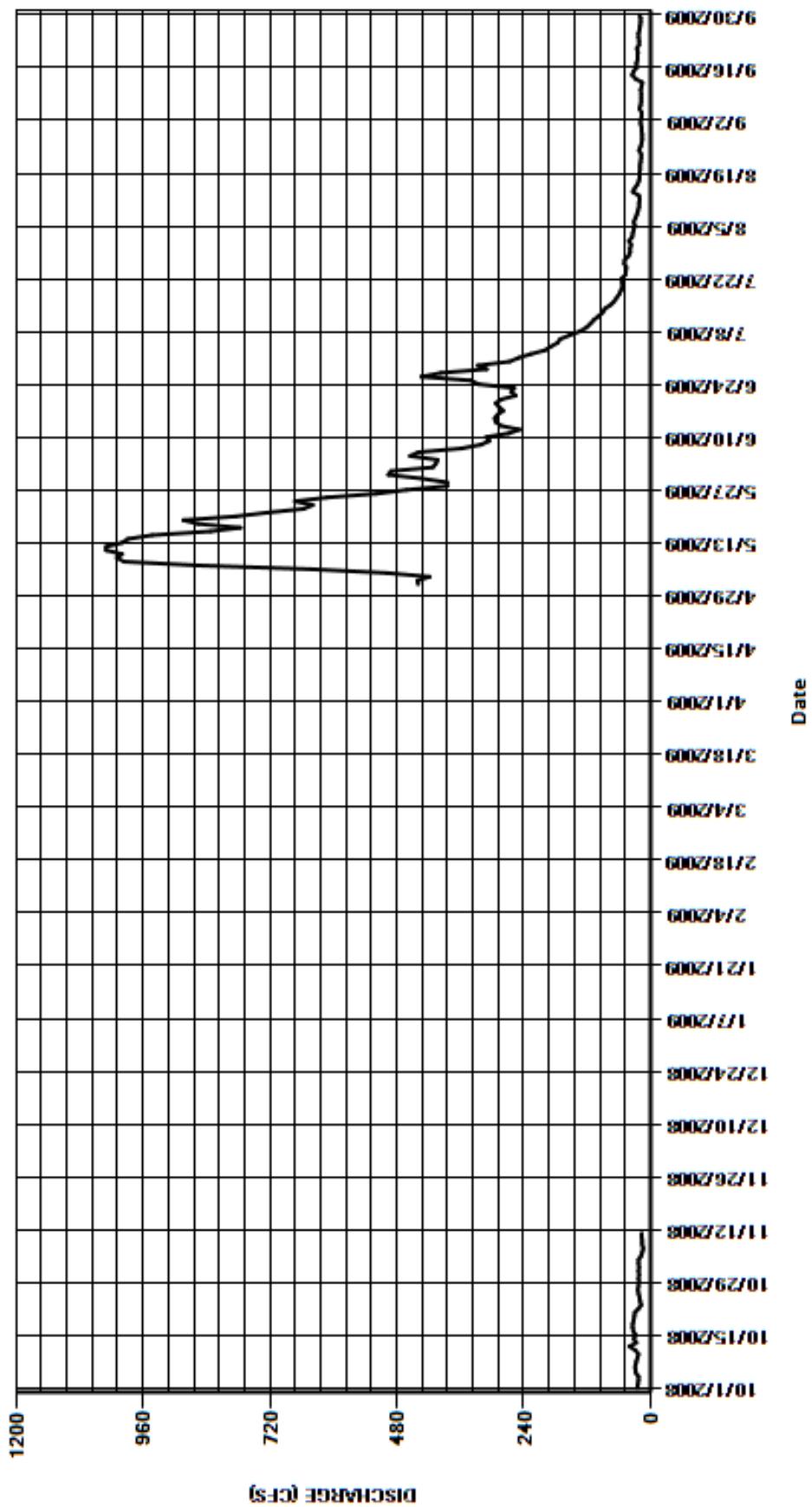
CAL YR	2008	TOTAL	41346	MEAN	211	MAX	1010	MIN	14	AC-FT	82010	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	36739	MEAN	189	MAX	1030	MIN	14	AC-FT	72870	(PARTIAL YEAR RECORD)

MAX DISCH: 1240 CFS AT 23:00 ON May. 11,2009 GH 5.92 FT. SHIFT -0.01 FT.

MAX GH: 5.97 FT. AT 13:15 ON Nov. 07,2008 (ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR
Water Year 2009

Location.-- Lat. 37°22'29", Long. 106°20'03", UTM X 381821.2, Y 4137279.0, in NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, T.36 N., R.6 E., Conejos County, Hydrologic Unit 13100002, on left bank 0.8 mi upstream from high-water line of Terrace Reservoir at elevation 8,568 ft., 3.0 mi. downstream from French Creek, and 15 mi. northwest of Capulin.

Drainage and Period of Record.-- 107 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and air temperature sensor in a 4-ft. diameter metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 10 feet below gaging station. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 4, 2008 through Mar. 25, 2009 when the station was closed for the winter. Stage-discharge relation was affected by ice Oct. 23-25, Nov. 6-30, Dec. 1-3, 2008. There were three instrumentation corrections made to the shaft encoder ranging from -0.02 to +0.01 feet. These corrections were prorated by time from previous visit. There were also three flush corrections, which were distributed from last point of inflection on the GH graph.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 23, 2008 to the Reference Point (RP) inside the gage using BM #1 as base. The RP was within allowable limits, so a correction was not required or made.

Rating.-- Control is a cobblestone riffle approximately fifty feet below the gage. Rating No. 17 was used again this year. The rating is well defined from 5 cfs to approximately 1300 cfs. Seventeen measurements (Nos. 166-182) were made this year ranging in discharge from 15.2 to 903 cfs. The measurements cover the discharge range experienced except for the lower daily flow on Dec. 15, 2008 and higher daily flows on May 8-15, 19, 2009. The peak flow of 1280 cfs occurred at 23:45 on May 11, 2009 at a gage-height of 3.62 ft. with a shift of -0.09 ft. It exceeded high measurement No. 175 (GH=3.14 ft.) made on May 12, 2009 by 0.48 ft. in stage.

Discharge.-- Shifting control method was used during all periods of good record. A shift curve was used from Mar. 25 to May 6, and May 8 through Sep. 23, 2009. Shifts were prorated from May 6 to May 8, due to floating trees moving on then off of control. Open water measurements show shifts varied between -0.18 (trees on control) and +0.01 ft. All were given full weight except Nos. 178, 180, and 181 which were adjusted by as much as 5% to better fit shift curve.

Special Computations.-- Discharge for periods of no gage-height and ice affected record were estimated using six measurements, weather records, partial day record, and comparison with Terrace Reservoir gain and outflow. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice-affected record, which are fair to poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR

RATING TABLE-- ALATERCO17 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

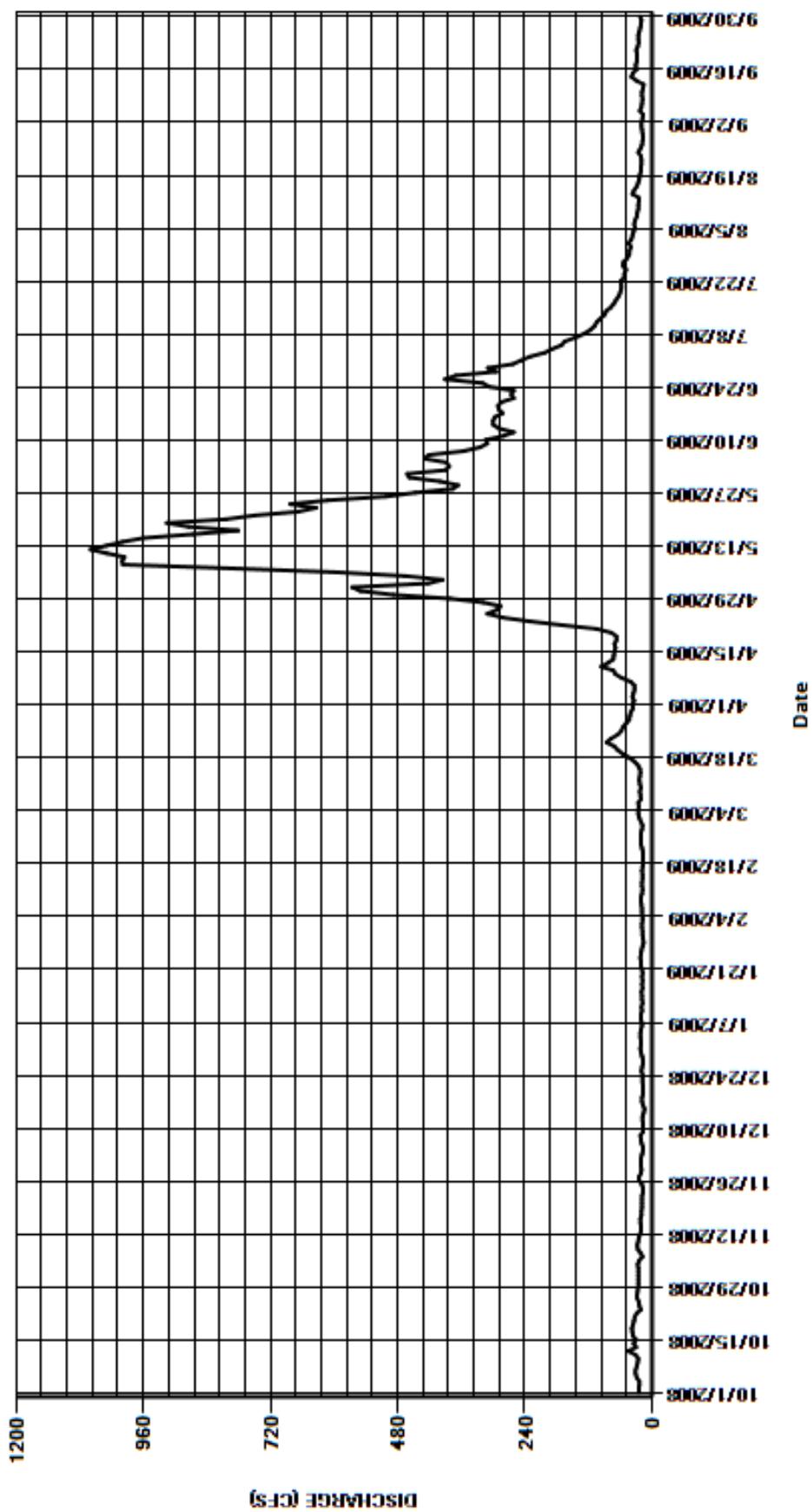
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	26	21	21	19	21	37	550	462	247	44	20
2	25	26	21	21	19	24	34	566	389	230	39	20
3	24	26	19	22	18	26	37	423	383	203	37	18
4	24	27	17	22	18	26	35	395	388	189	35	17
5	29	24	17	21	19	25	33	467	430	171	32	23
6	31	18	20	19	19	26	33	598	421	165	34	20
7	31	22	21	20	20	21	40	793	356	145	32	19
8	29	27	22	21	21	22	57	999	325	129	29	18
9	27	28	17	21	21	23	69	1000	311	117	28	19
10	26	26	17	19	19	21	73	996	314	109	26	19
11	31	25	17	20	18	23	96	1030	281	105	26	17
12	45	22	18	18	19	24	83	1060	261	98	25	16
13	30	21	18	19	19	23	73	1030	289	90	25	30
14	35	21	16	19	18	22	72	1000	300	87	37	39
15	30	22	14	20	18	23	71	961	300	78	34	36
16	36	22	17	18	19	27	69	867	297	72	29	29
17	37	20	19	19	18	34	71	781	282	68	26	31
18	38	20	19	18	17	44	67	875	289	63	24	29
19	36	19	17	19	17	56	67	916	291	60	23	28
20	34	19	17	18	17	65	77	804	284	58	21	28
21	33	19	17	19	17	72	105	751	261	58	21	30
22	29	19	18	21	19	86	170	667	266	59	20	27
23	21	17	18	21	21	77	231	634	261	52	20	25
24	24	17	18	22	21	65	283	683	307	52	21	26
25	25	19	20	21	21	58	311	612	320	49	26	26
26	28	24	19	20	21	55	293	502	391	55	22	24
27	28	25	17	18	19	49	286	447	370	54	19	22
28	27	21	17	16	18	43	319	376	294	47	18	21
29	26	20	19	17	---	42	381	366	310	43	17	20
30	26	21	21	18	---	40	488	400	263	43	18	23
31	26	---	22	18	---	36	---	458	---	40	19	---
TOTAL	916	663	570	606	530	1199	4061	22007	9696	3036	827	720
MEAN	29.5	22.1	18.4	19.5	18.9	38.7	135	710	323	97.9	26.7	24
AC-FT	1820	1320	1130	1200	1050	2380	8050	43650	19230	6020	1640	1430
MAX	45	28	22	22	21	86	488	1060	462	247	44	39
MIN	21	17	14	16	17	21	33	366	261	40	17	16
CAL YR	2008	TOTAL	48444	MEAN	132	MAX	1050	MIN	14	AC-FT	96090	
WTR YR	2009	TOTAL	44831	MEAN	123	MAX	1060	MIN	14	AC-FT	88920	

MAX DISCH: 1280 CFS AT 23:45 ON May. 11,2009 GH 3.62 FT. SHIFT -0.09 FT.

MAX GH: 3.62 FT. AT 23:45 ON May. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR
Water Year 2009

Location.-- Lat. 37°21'20", Long. 106°16'50", UTM X 386855.0, Y 4134774.2, NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T.36 N., R.6 E., Conejos County, Hydrologic Unit 13010002, on left bank 0.5 mi downstream from Terrace Reservoir, 11.0 mi northwest of Capulin, Co.

Drainage and Period of Record.-- 116 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 6-foot square concrete aggregate shelter and 3' diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. A bank-operated cableway is located 100 feet downstream. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 9, 2008 to Feb. 28, 2009 when the well was frozen. There was one instrument correction of -0.01 feet made to the shaft encoder. It was prorated by time from previous visit.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 23, 2008 to the Reference Point (RP) inside the gage using BM #2 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control is a gravel and cobblestone riffle approximately one hundred fifty feet below the gage. Rating No. 13 was used again this year. The rating is fairly well defined from 100 to 1000 cfs. A new rating should be developed next year to better define the lower end. Seventeen measurements (Nos. 126-142) were made this year ranging in discharge from 1.65 to 898 cfs. They cover the discharge range experienced except for higher daily flows May 13-16, 2009. The peak flow of 1120 cfs occurred at 03:45 on May 15, 2009 at a gage-height of 4.91 ft. with a shift of -0.04 ft. It exceeded high measurement No. 135 (GH = 4.64), made May 12, 2009, by 0.27 ft. in stage.

Discharge.-- Shifting control method was used during all open water periods. A variable shift curve was used from May 12 through Sep. 23, 2009. Measurements show shifts varied between -0.09 and +0.04 ft. All were given full weight and applied except Nos. 134, 136, 139 and 140 which were adjusted as much as 5% and No. 127, which was rated fair and adjusted by 7%.

Special Computations.-- Discharge for periods of no gage-height record was estimated on the basis of three measurements, partial day records, temperature records, and Terrace Reservoir storage volume. A hydrograph was not used as this station is directly below a reservoir.

Remarks.-- Record is good except for the period of no gage-height record, which is fair. Period of no gage-height record is rated fair, rather than poor, because the gage is directly below a reservoir and gate changes were not made during this period. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR

RATING TABLE--

ALABELCO13 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	32	2	2.2	2.7	3.2	4.5	442	425	309	63	69
2	45	32	2	2.3	2.8	3.2	4.5	489	433	294	61	69
3	44	33	2	2.3	2.8	3.2	4.5	483	390	286	65	68
4	42	34	2	2.3	2.8	3.2	4.7	419	384	265	70	67
5	41	23	2	2.3	2.8	3.2	4.7	393	401	244	86	71
6	39	1.8	2	2.3	2.8	3.3	4.7	478	429	226	97	74
7	38	1.7	2.1	2.3	2.8	3.3	4.9	549	441	209	99	74
8	38	1.7	2.2	2.4	2.8	3.3	5	648	376	195	99	74
9	38	1.7	2.2	2.4	2.9	3.3	38	729	307	189	101	60
10	38	1.8	2.2	2.4	2.9	3.4	65	758	286	188	106	52
11	38	1.8	2.2	2.4	2.9	3.4	85	771	286	188	107	52
12	38	1.8	2.2	2.4	2.9	3.4	108	871	256	187	116	52
13	41	1.8	2.2	2.4	2.9	3.4	117	956	253	186	121	52
14	45	1.8	2.2	2.5	2.9	3.4	96	1020	261	181	116	50
15	45	1.8	2.2	2.5	3	3.4	77	986	275	164	110	43
16	41	1.8	2.2	2.5	3	3.5	73	906	298	139	111	36
17	38	1.8	2.2	2.5	3	3.6	74	824	305	124	125	35
18	38	1.8	2.2	2.5	3	3.6	74	760	296	120	113	35
19	38	1.8	2.2	2.5	3	3.6	76	807	290	117	105	35
20	38	1.8	2.2	2.6	3	3.6	78	878	312	114	105	35
21	38	1.8	2.2	2.6	3	3.8	96	839	326	112	105	35
22	35	1.8	2.2	2.6	3.1	3.8	134	755	305	111	104	35
23	29	1.8	2.2	2.6	3.1	3.8	167	661	295	111	102	33
24	23	1.8	2.2	2.6	3.1	4	254	618	294	114	101	28
25	22	1.9	2.2	2.6	3.1	3.9	317	624	338	118	95	25
26	22	2	2.2	2.7	3.1	3.9	323	577	392	119	92	25
27	22	2	2.2	2.7	3.1	4	311	472	450	118	77	25
28	25	2	2.2	2.7	3.2	4.1	305	418	438	117	68	23
29	29	2	2.2	2.7	---	4.3	335	369	377	108	67	22
30	32	2	2.2	2.7	---	4.3	390	354	345	94	67	20
31	32	---	2.2	2.7	---	4.5	---	363	---	75	67	---
TOTAL	1117	199.8	66.9	77.2	82.5	111.9	3630.5	20217	10264	5122	2921	1374
MEAN	36	6.66	2.16	2.49	2.95	3.61	121	652	342	165	94.2	45.8
AC-FT	2220	396	133	153	164	222	7200	40100	20360	10160	5790	2730
MAX	45	34	2.2	2.7	3.2	4.5	390	1020	450	309	125	74
MIN	22	1.7	2	2.2	2.7	3.2	4.5	354	253	75	61	20

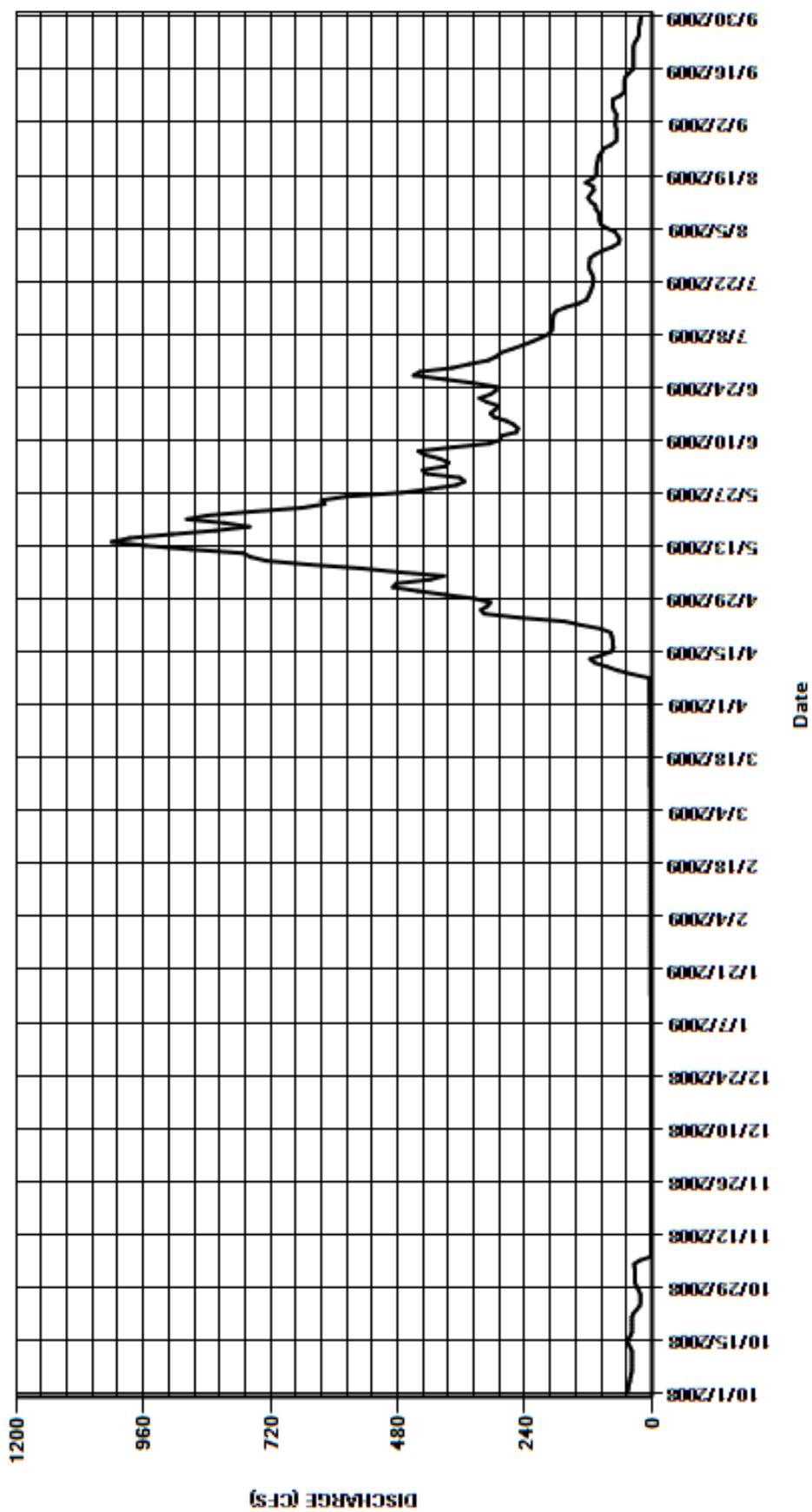
CAL YR	2008	TOTAL	48414.3	MEAN	132	MAX	797	MIN	1.7	AC-FT	96030
WTR YR	2009	TOTAL	45183.8	MEAN	124	MAX	1020	MIN	1.7	AC-FT	89620

MAX DISCH: 1120 CFS AT 03:45 ON May. 15,2009 GH 4.91 FT. SHIFT -0.04 FT.

MAX GH: 4.91 FT. AT 03:45 ON May. 15,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
Water Year 2009

Location.-- Lat. 37°12'32", Long. 106°11'16", UTM X 394552.1, Y 4118707.6, in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, T.34 N., R.7 E., Conejos County, Hydrologic Unit 13010002, on left bank 2.7 mi. downstream from Canyon Del Rancho, 7 mi. southwest of Capulin, and 16.5 mi. downstream from La Jara Reservoir.

Drainage and Period of Record.-- 98 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping-bucket rain gauge in a 42-inch diameter CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 24, 2008 through Feb. 26, 2009 when the shaft encoder float was affected by ice in oil cylinder. Stage-discharge relation was affected by ice Oct. 23-25, Nov. 4-30, Dec. 1-23, 2008 and Feb. 27, 28, Mar. 1-16, 28, and 29, 2009.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 23, 2008 to the Reference Point (RP) inside the gage using BM #1 as base. The RP was within allowable limits, so no correction was made.

Rating.-- The control is a concrete broad crested weir with a v-notch cut into its center, approximately 15 feet below the gage. Minor shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating No. 19, in use since October 1, 2004, was used again this year. It is well defined from 1.7 to 142 cfs. Sixteen measurements (Nos. 127-142) were made this year ranging in discharge from 2.66 to 121 cfs. They cover the discharge range experienced except for higher daily flows on April 22-25, 2009. The peak flow of 206 cfs occurred at 03:45 on April 23, 2009 at a gage-height of 2.48 (GH Corr. -0.02 ft. applied) feet with a shift of +0.06 feet. It exceeded high measurement No. 134 (GH=2.11), made Apr. 23, 2009 by 0.37 feet in stage.

Discharge.-- Shifting control method was used for all open water periods. A shift curve (LAJCAPVS0901) was used for the period Mar. 25 to June 16, 2009. During other periods, shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied from -0.01 and +0.07 feet. All measurements were given full weight, except for Nos. 128, 129, 134-136, 140, and 141, which were adjusted by as much as 5 percent to smooth shift distribution. There were two high measurements, Nos. 134 and 135, which resulted in the same flow with a 0.02 ft. difference in gage-heights. Both measurements were adjusted by 1% and 2% respectively to the shift between them.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five measurements, and weather records. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN

RATING TABLE--

LAJCAPCO19TMP USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

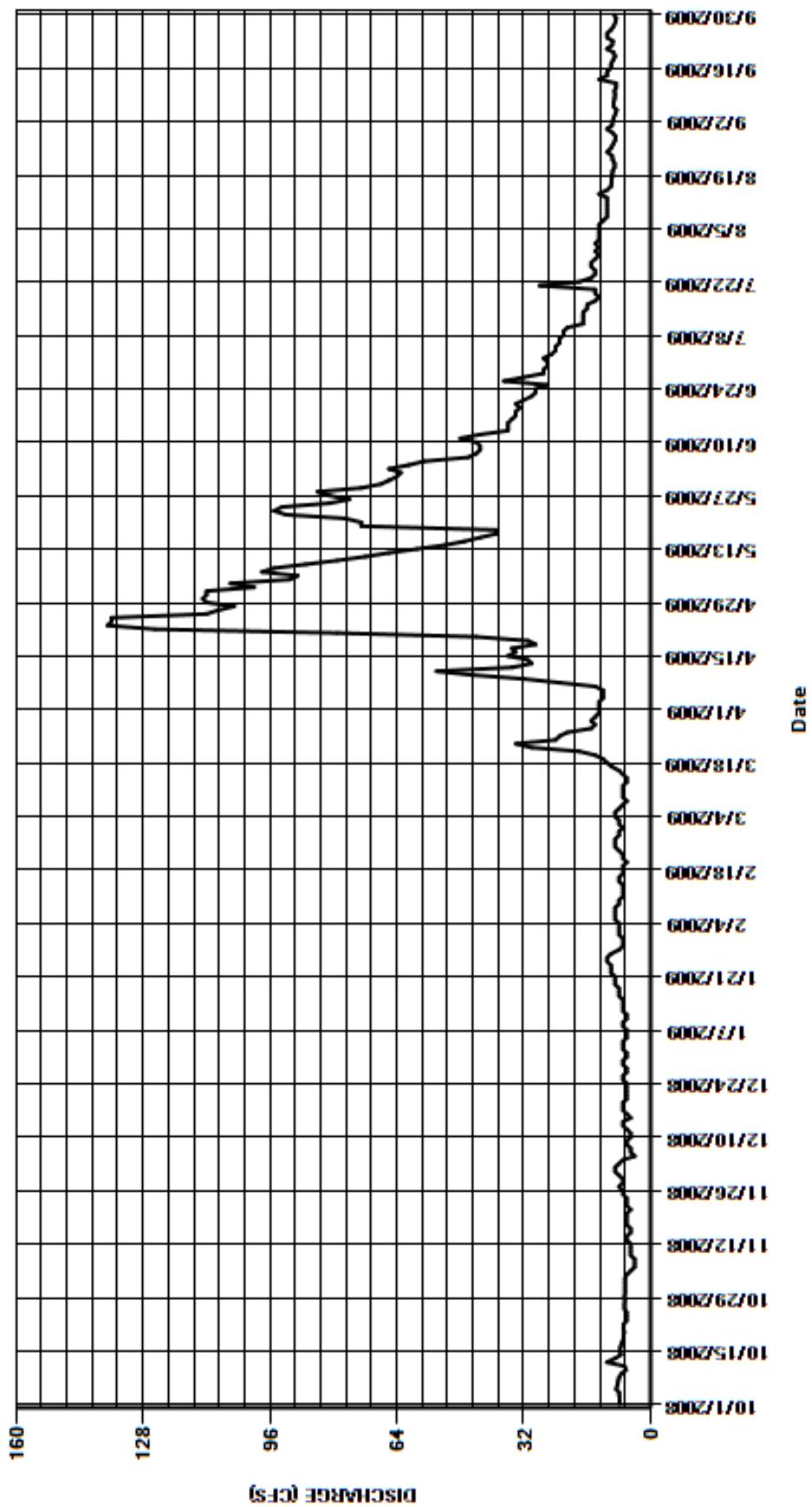
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.8	6.5	9	6	8	7	13	112	64	26	14	9.7
2	7.8	6.5	9	7	8	8	13	112	63	27	13	9.6
3	7.9	6.5	8	7	8	8	13	100	66	25	13	9.3
4	7.9	6	7	7	8	9	12	106	61	24	13	8.9
5	8.7	5	4	6	9	9	12	91	57	24	13	8.6
6	8.4	4	5	6	9	8	12	89	46	23	13	9.4
7	8.2	4	5	6	9	7	14	98	44	23	12	9.3
8	8	4	6	7	9	6	23	95	43	22	11	9.1
9	7.4	5	6	7	8	7	32	87	43	22	11	9
10	6.2	5	5	6	8	7	45	79	44	21	11	9.1
11	6.6	5	5	6	7	7	54	72	48	17	11	8.7
12	11	5	6	7	7	7	35	66	43	17	11	8.7
13	9	6	7	7	7	6	30	59	36	17	11	13
14	7.5	6	7	7	7	6	31	52	36	17	13	11
15	7.8	5	5	7	8	7	36	47	36	16	11	11
16	7.6	5	6	8	8	8	34	43	35	16	10	10
17	7.3	6	7	8	7	9.8	35	39	34	14	9.9	10
18	6.9	6	7	8	7	11	29	39	34	13	9.8	9.5
19	6.8	6	7	9	7	12	31	73	33	14	9.7	9
20	6.7	6	6	9	6	14	44	73	34	14	9.6	9.3
21	6.9	5	6	9	7	18	79	77	32	28	9.1	11
22	6.8	6	6	10	7	30	125	92	30	18	9.1	9.7
23	6	6	6	10	8	34	137	95	29	15	9.6	9.5
24	6	6	6	10	9	24	136	93	29	14	9.7	11
25	6	7	7	11	9	23	136	81	26	14	11	11
26	6.6	7	7	11	9	21	112	76	37	15	10	10
27	6.6	8	6	10	8	15	109	81	32	15	9.5	9.3
28	6.5	7	6	8	8	14	105	84	27	14	9	8.9
29	6.6	7	7	7	---	15	112	73	27	13	8.8	8.7
30	6.5	8	7	7	---	14	113	68	26	14	9.6	9.3
31	6.5	---	6	7	---	13	---	66	---	13	11	---
TOTAL	226.5	175.5	197.0	241.0	220.0	384.8	1712	2418	1195	565	336.4	290.6
MEAN	7.31	5.85	6.35	7.77	7.86	12.4	57.1	78	39.8	18.2	10.9	9.69
AC-FT	449	348	391	478	436	763	3400	4800	2370	1120	667	576
MAX	11	8	9	11	9	34	137	112	66	28	14	13
MIN	6	4	4	6	6	6	12	39	26	13	8.8	8.6

CAL YR	2008	TOTAL	7401.4	MEAN	20.2	MAX	116	MIN	4	AC-FT	14680
WTR YR	2009	TOTAL	7961.8	MEAN	21.8	MAX	137	MIN	4	AC-FT	15790

MAX DISCH: 206 CFS AT 03:45 ON Apr. 23,2009 GH 2.48 FT. SHIFT 0.06 FT. (GH CORR. -0.02 FT. APPLIED)
 MAX GH: 2.48 FT. AT 03:45 ON Apr. 23,2009 (GH CORR. -0.02 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
Water Year 2009

Location.-- Lat. 37°17'55", Long. 105°53'49", UTM X 424251.0, Y 4128328.0, SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T.35 N., R.10 E., Conejos County, Hydrologic Unit 13100002, on right bank of channel approximately 150 ft. north of road, 13 miles south of Alamosa, 7 miles northwest of LaSause.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a steel shelter and a 24 inch diameter CMP well at a three foot Parshall Flume. The primary reference gage is drop tape from a mark chiseled in the shelf support frame. The secondary reference is outside staff gage in flume. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods: Dec. 9-18, 2008 when the well was frozen; Dec. 19, 2008 through Mar. 5, 2009 when station was closed for the winter; Mar. 26, 27, 30, Apr. 6, 7, 9, 11, 13, Aug. 10-13, 29-31, and Sep. 2-30, 2009, when gage was isolated for all or portions of the day. Stage-discharge relation was affected by ice Nov. 15-17, 21-26, 29, 30 Dec. 1, 2, 4-8, 2008 and Mar. 12, 14, 15, 2009.

Datum Corrections.-- The Parshall flume was last inspected with levels completed last year on July 30, 2008. The flume is in poor condition. The levels, as well as this year's record, indicate considerable lateral slope away from well on REW and downward toward staff on LEW.

Rating.-- Control is a three-foot Parshall Flume. Rating No. 1, used since Aug. 3, 1989, was used again this year. It is a standard three foot Parshall Flume rating table. Shifting is caused by the unlevel flume, and also sand and aquatic plant growth accumulating in front of and in the flume. Discharge measurements made while this rating has been in use range from 0 to 33 cfs. Seventeen measurements (Nos. 302-318) were made this year ranging in discharge from 0.80 (gage isolated) to 20.6 cfs. They cover the discharge range experienced except for the lower daily flows on August 12 and September 4-30, 2009 and the higher daily flows on May 27 and June 4, 6-9, 11, 12, 2009. The peak flow of 33.9 cfs occurred at 12:15 on Jun. 11, 2009 at a gage-height of 1.98 ft. with a shift of -0.04 ft. It exceeded high Meas. No. 313 (GH = 1.44), made May 26, 2009, by 0.54 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts varied between -0.08 and +0.10 ft. All were given full weight and applied, except Nos. 311, 312, and 315 which were adjusted by as much as 6% to smooth shift distribution.

Special Computations.-- Discharge for periods of winter no gage-height and ice affected record was estimated on the basis of seven measurements, partial record days, weather records, and comparison with the station "Norton Drain near LaSause". Discharge for period of flume submergence ('c' record) was estimated by distributing the backwater affected shifts through the period by time. These shifts are fairly consistent and indicate minimal submergence. Discharge for periods of no gage-height record due to gage isolation was estimated using one measurement and comparison with the hydrograph from "Norton Drain near LaSause". A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor; and the period of flume submergence, which is fair. The maximum discharge occurred during the period of flume submergence and should also be considered fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES

RATING TABLE--

NORDSCCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	2.4	2.5	2	1.9	2.2	2.4	10	11	9.4	3.9	1.6
2	1.8	3.1	2.4	2	1.9	2.3	2	7.3	15	7.9	4.3	1
3	1.7	3	2.3	2	1.9	2.4	1.5	5.5	17	6.4	4	0.9
4	1.6	2.4	2.2	2	1.9	2.5	1.5	4.7	22	7.6	4.2	0.7
5	1.6	1.9	2.1	1.9	1.9	2.6	1.7	7.2	19	8.2	3.3	0.6
6	1.6	1.8	2.1	1.9	1.9	2.7	1.8	10	22	6.7	2.4	0.5
7	1.6	1.9	2.1	1.9	1.9	2.8	1.6	9.2	22	8.8	2.6	0.4
8	1.5	2.4	2	1.9	1.9	2.8	1.8	8.8	26	9	1.9	0.3
9	1.6	3.7	1.8	1.9	1.9	2.6	1.4	6.2	23	10	1.7	0.2
10	1.6	3.5	1.8	1.8	1.8	2.8	1.5	7.5	20	6.7	1.1	0.2
11	1.6	3	1.8	1.8	1.8	2.6	1.2	8.2	30	4.2	0.8	0.1
12	2.5	4.9	1.8	1.8	1.8	2.8	1.8	11	23	3.3	0.7	0.1
13	2.8	3.6	2	1.8	1.8	2.7	1.4	11	16	3.8	1.2	0.2
14	4.9	3.2	1.9	1.8	1.8	2.6	1.5	12	15	5.2	2.1	0.2
15	4	3	1.9	1.8	1.8	2.6	1.6	13	14	5.5	2.8	0.3
16	3.9	2.9	2	1.7	1.8	2.6	2.4	13	12	5.1	2	0.3
17	3.9	2.8	2.1	1.7	1.8	2.6	1.7	11	11	3.4	1.8	0.3
18	3.2	2.8	2.2	1.7	1.8	2.6	1.5	11	11	3.1	1.8	0.3
19	1.9	2.7	2.1	1.7	1.9	2.5	1.8	12	11	3.9	3.1	0.3
20	1.8	2.6	2	1.7	1.9	2.4	2	10	7.1	2.8	4.6	0.3
21	1.8	2.6	1.9	1.7	1.9	2.3	2.2	11	16	2.6	3.5	0.3
22	1.7	2.5	1.9	1.8	1.9	2	2.2	17	17	2.9	2.8	0.3
23	1.8	2.5	1.9	1.8	2	1.9	2.3	20	9.9	3.6	2.6	0.3
24	1.8	2.4	1.7	1.8	2	2	2.2	16	12	3.8	2.4	0.4
25	1.7	2.3	1.8	1.9	2	1.8	2.2	18	13	3.1	2.1	0.4
26	1.7	2.4	1.8	1.9	2.1	1.5	2.2	20	15	2.5	2	0.4
27	1.7	2.6	1.7	1.9	2.1	1.6	2.5	22	16	4	1.8	0.4
28	1.7	2.6	1.6	1.9	2.1	2.2	3	18	18	3.9	1.6	0.3
29	1.7	2.5	1.7	1.8	---	3	3.5	14	12	3.5	1.1	0.3
30	2.8	2.5	1.8	1.8	---	2.8	8.5	12	9.6	3.1	0.9	0.4
31	2.8	---	1.9	1.8	---	2.8	---	11	---	3	0.9	---
TOTAL	68.2	82.5	60.8	56.9	53.2	75.6	64.9	367.6	485.6	157.0	72.00	12.30
MEAN	2.2	2.75	1.96	1.84	1.9	2.44	2.16	11.9	16.2	5.06	2.32	0.41
AC-FT	135	164	121	113	106	150	129	729	963	311	143	24
MAX	4.9	4.9	2.5	2	2.1	3	8.5	22	30	10	4.6	1.6
MIN	1.5	1.8	1.6	1.7	1.8	1.5	1.2	4.7	7.1	2.5	0.7	0.1

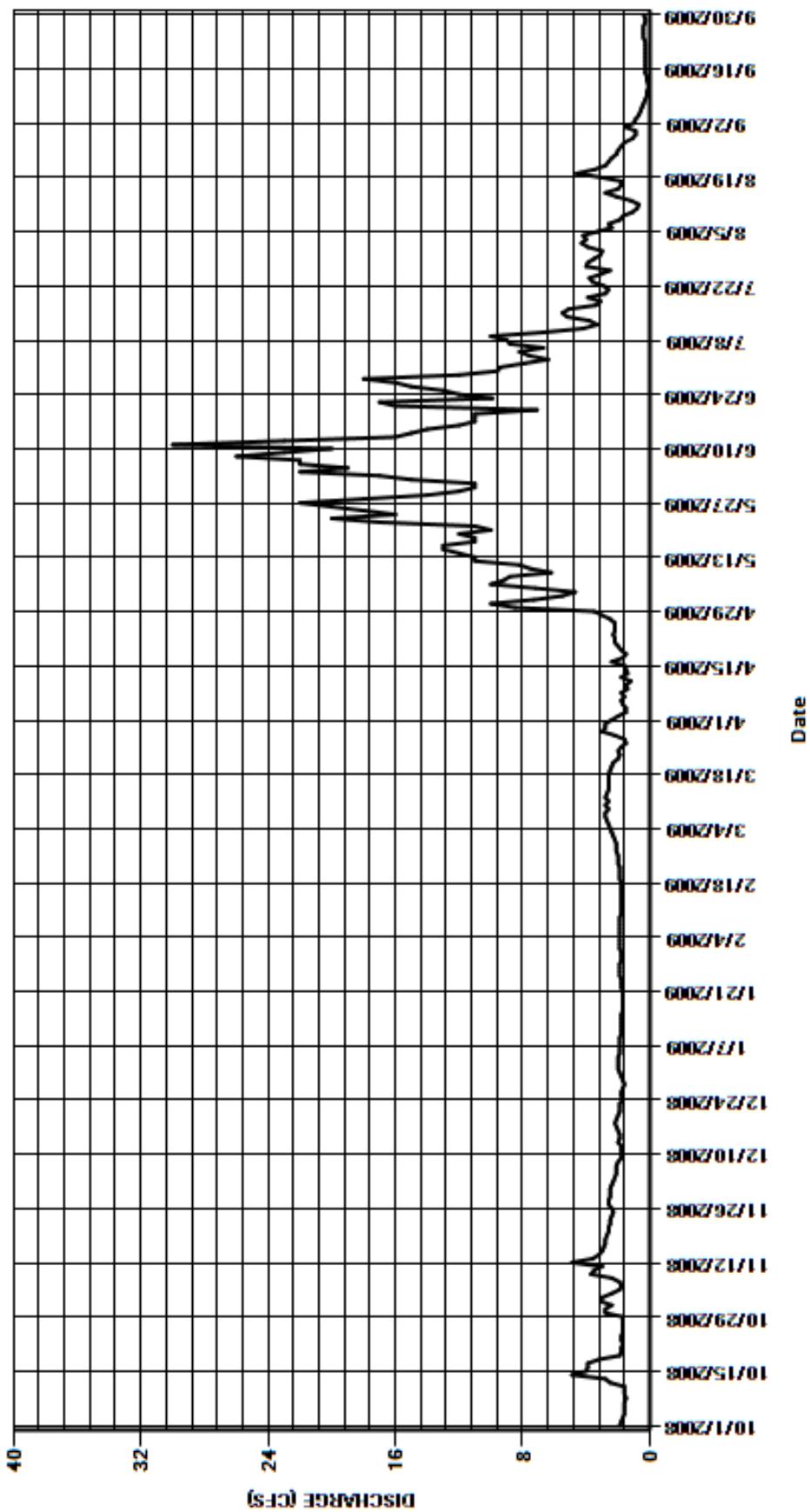
CAL YR	2008	TOTAL	1597.20	MEAN	4.36	MAX	19	MIN	0.2	AC-FT	3170
WTR YR	2009	TOTAL	1556.60	MEAN	4.26	MAX	30	MIN	0.1	AC-FT	3090

MAX DISCH: 34 CFS AT 12:15 ON Jun. 11,2009 GH 1.98 FT. SHIFT -0.04 FT.

MAX GH: 1.98 FT. AT 12:15 ON Jun. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
NORTON DRAIN NEAR LA SAUSES
Water Year 2009

Location.-- Lat. 37°20'10", Long. 105°46'13", UTM X 432032.9, Y 4132127.3, SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, T.36 N., R.11 E., Conejos County, Hydrologic Unit 13010002, on left bank of channel, 1 1/2 miles above confluence with Rio Grande River, 11 miles south of Alamosa, 5 miles North of LaSause.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a 36 inch diameter CMP shelter and well at a modified six-foot Parshall Flume. The primary reference gage is drop tape from a mark chiseled in the shelf support frame. The secondary reference is outside staff gage in flume. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 9-18, 2008 when the well was frozen and Dec. 19, 2008 – Mar. 5, 2009 when the station was closed for the winter. Stage-discharge relation was affected by ice Nov. 5-13, 15-30, and Dec. 1-8, 2008.

Datum Corrections.-- Flume inspection and levels were last completed last year on July 30, 2008. The flume is in good condition. Since this Parshall Flume has been modified with ramp inserts at the throat, it is not expected to perform as a Parshall flume.

Rating.-- The permanent control for the water year was the modified six-foot Parshall Flume. Rating No. 04T1 was created June 18, 2008 and used since January 1, 2008. Shifting is caused by sand and moss accumulating in front of and in the flume. Seventeen measurements (Nos. 720-736) were made this year ranging in discharge from 0.64 to 39.1 cfs. The measurements cover the flow experienced except the higher daily flow on June 11, 2009 and the lower daily flows on Sep. 11, 12, 2009. The peak flow of 46.2 cfs occurred at 17:15 on Jun. 11, 2009 at a gage-height of 1.52 feet (GH corr. +0.04 feet applied) and shift of -0.03 feet. It exceeded high measurement No. 731 (GH = 1.39), made May 26, 2009 by 0.13 feet in stage.

Discharge.-- Shifting control method was used for all periods of good record. A variable shift curve, NORDLSSVS0901, was used to define the stage-shift relation from May 12 to Jul. 10, 2009. Since the high measurement of May 26, 2009 was the highest since the flume was modified, the shift curve effectively redefines the upper end of the rating. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts varied between -0.03 and +0.03 feet. All measurements were given full weight and applied as defined by measurements except Nos. 720, 728, 730, 734 and 736 which were adjusted as much as 9% to smooth shift distribution. Measurement No. 732 was not used due to assumed poor velocity profile or meter problem. A comparison with other measurements at same location indicates significant slower velocities.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated on the basis of seven measurements, partial record days, weather records, and comparison with the station "South Channel Norton Drain near LaSause". A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NORTON DRAIN NEAR LA SAUSES

RATING TABLE--

NORDLSCO04T1 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	2.5	2.6	1.6	1.5	2.8	3.6	13	23	18	3	1.6
2	1.7	2.9	2.5	1.6	1.5	2.9	3	12	26	16	3.3	1.5
3	1.5	3.1	2.4	1.6	1.5	3.1	3	10	28	14	3.6	1.4
4	1.4	2.9	2.3	1.5	1.5	3.2	2.5	9.1	34	13	3.4	1.2
5	1.3	2.1	2.2	1.5	1.5	3.2	3.1	11	32	13	3.6	1.1
6	1.1	2	2.2	1.5	1.5	3.3	2.9	14	32	12	3.1	1
7	1.1	2.1	2.2	1.5	1.5	2.8	3	14	33	11	2.5	0.91
8	1.1	2.4	2.1	1.5	1.5	2.8	2.8	14	35	12	2.4	0.8
9	1.1	3.2	1.6	1.4	1.4	3.5	2.5	12	34	12	1.9	0.7
10	1.2	4	1.4	1.4	1.4	3.1	2.7	12	33	12	1.6	0.69
11	1.2	3.5	1.4	1.4	1.4	3	2.7	14	41	12	1.6	0.62
12	1.3	6	1.4	1.4	1.4	3.2	3.4	20	37	11	1.3	0.62
13	2.6	4.6	1.6	1.4	1.4	3.2	3.3	18	29	9.6	1.2	0.73
14	5	3.9	1.5	1.4	1.4	3.5	2.9	19	27	10	1.4	0.68
15	4.3	3.4	1.4	1.3	1.4	3.2	2.6	20	26	11	2.5	0.83
16	4.4	3.2	1.6	1.3	1.4	3	3.4	22	23	12	2.2	0.78
17	4.1	3.1	1.7	1.3	1.4	3.1	3.2	18	22	11	1.6	0.8
18	4.1	3	1.7	1.3	1.5	3	2.8	18	22	8.7	1.6	0.77
19	2.5	2.9	1.6	1.3	1.5	3	2.7	20	23	7	1.9	0.77
20	1.9	2.8	1.5	1.3	1.5	3	3	18	19	6.1	3.5	0.76
21	1.7	2.8	1.4	1.4	1.5	3	3	18	23	4.8	3.7	0.77
22	1.8	2.7	1.4	1.4	1.6	3	2.9	26	29	4.4	2.9	0.83
23	1.9	2.7	1.4	1.4	1.6	2.9	3	30	21	4.4	2.6	0.86
24	1.9	2.6	1.2	1.5	1.7	3	2.2	29	20	4.5	2.6	0.88
25	2	2.5	1.3	1.5	1.7	2.9	3.1	31	23	4.3	2.6	0.87
26	1.6	2.5	1.3	1.5	1.9	2.4	5.7	34	27	3.3	2.3	0.88
27	1.6	2.6	1.2	1.5	2.2	1.2	6.2	39	25	2.6	2	0.9
28	1.7	2.6	1.1	1.4	2.4	3.7	6.6	39	26	3.1	1.8	0.83
29	1.6	2.6	1.2	1.4	---	4.2	6.8	32	22	3.4	1.6	0.78
30	2.5	2.6	1.3	1.4	---	3.5	9.7	26	21	3.2	1.4	0.88
31	2.9	---	1.4	1.5	---	3.4	---	23	---	3	1.4	---
TOTAL	65.9	89.8	51.1	44.4	43.7	95.1	108.3	635.1	816	272.4	72.1	26.74
MEAN	2.13	2.99	1.65	1.43	1.56	3.07	3.61	20.5	27.2	8.79	2.33	0.89
AC-FT	131	178	101	88	87	189	215	1260	1620	540	143	53
MAX	5	6	2.6	1.6	2.4	4.2	9.7	39	41	18	3.7	1.6
MIN	1.1	2	1.1	1.3	1.4	1.2	2.2	9.1	19	2.6	1.2	0.62

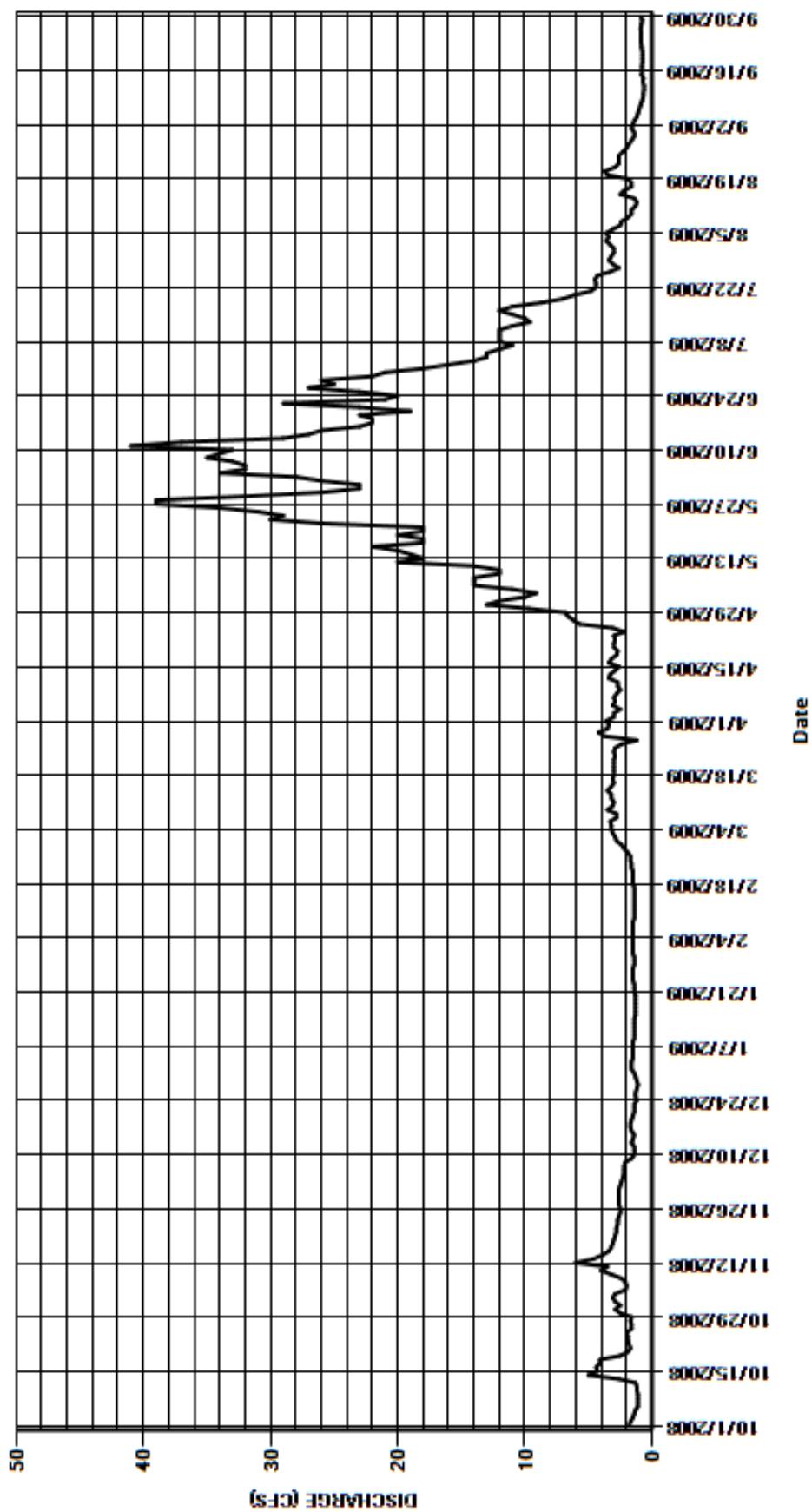
CAL YR	2008	TOTAL	1967.90	MEAN	5.38	MAX	24	MIN	0.2	AC-FT	3900
WTR YR	2009	TOTAL	2320.64	MEAN	6.36	MAX	41	MIN	0.62	AC-FT	4600

MAX DISCH: 46 CFS AT 17:15 ON Jun. 11,2009 GH 1.52 FT. SHIFT -0.03 FT. (GH CORR. +0.04 FT. APPLIED)

MAX GH: 1.52 FT. AT 17:15 ON Jun. 11,2009 (GH CORR. +0.04 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTON DRAIN NEAR LA SAUSSES
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES
Water Year 2009

Location.-- Lat. 37°18'58", Long. 105°44'32", UTM X 434183.1, Y 4130200.1, in sec. 35, T.36 N., R.II E., Conejos County, Hydrologic Unit 13010002, on right bank 0.2 mi upstream from the historical channel of Trinchera Creek, 3.2 mi north of Lasauses, and 13 mi southeast of Alamosa.

Drainage and Period of Record.-- Approximately 5,740 mi², includes 2,940 mi² in closed basin in northern part of San Luis Valley, Co. May 1936 to current year. Water quality data from 1993 to 1996.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 7 ft. by 7 ft. exposed aggregate building with 4 ft. diameter concrete well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 27, 2008 through Mar. 1, 2009 when well was frozen, and Oct. 1, 2008, Jul. 22-28, 2009 when the inlets were temporarily plugging and naturally flushing. Stage-discharge relation was affected by ice Nov. 7, 8, 24-27, Dec. 8-26, 2008.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Jul. 28, 2009 using B.M. No. 2 as base. The RP elevation was within allowable limits, so no corrections were made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- The control is a sand streambed and channel. The sand movement causes numerous shift changes. Rating No. 12 was used this year. Thirteen measurements (Nos. 202-214) were made this year ranging in discharge from 36.0 to 579 cfs. They cover the discharge range experienced except for the lower daily flows of Aug. 6-14, 19, 20, 23, 24, Sep. 3-10, 29, 30, 2009; and the higher daily flows of May 8-11, 14, 24-30, 2009. The peak flow of 869 cfs occurred at 05:15 on May 10, 2009 at a gage-height of 4.68 ft. with a shift of -0.14 ft. It exceeded high measurement No. 208 (GH = 3.90 ft.) by 0.78 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and distributed by time. This year's measurements showed shifts varied between -0.14 and +0.16 ft. All shifts were given full weight and applied except for Nos. 205, 206, 210, and 211, which were adjusted as much as 3% to smooth shift distribution.

Special Computations.-- Discharge for periods of winter no gage-height and ice affected record was estimated using comparison with nearby stations with a river accounting sheet. Discharge for periods of no gage height due to inlets temporarily plugging and flushing was estimated using gage-height trend associated with gage-height at natural flushes. It was determined that the stage-discharge relation was affected by high water in the Conejos River at the confluence downstream from gage. Therefore, the shifts through this period, Apr. 22 to Jun. 2, 2009 were distributed by time to best reflect the flow at downstream station Rio Grande near Lobatos minus the Conejos River near La Sauses.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor; and the period Apr. 22 to Jun. 2, 2009, including the peak discharge should be considered fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES

RATING TABLE--

RIOTRICO12 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	48	69	205	235	345	440	192	510	298	76	36
2	42	49	70	210	235	349	396	235	508	266	65	36
3	45	58	67	210	235	353	315	264	470	298	53	35
4	47	61	67	210	235	380	260	354	410	339	47	35
5	52	65	64	205	245	398	222	402	365	301	42	35
6	56	64	67	210	255	390	193	427	348	263	34	34
7	54	64	64	220	250	379	172	449	343	244	30	32
8	54	64	60	205	255	365	136	628	344	221	26	32
9	59	66	60	205	255	341	136	781	319	215	27	33
10	53	65	75	200	250	322	136	793	299	190	27	35
11	56	64	80	205	250	332	139	596	318	167	29	38
12	58	66	80	205	255	331	146	470	343	150	32	40
13	56	63	80	205	250	323	174	508	323	134	29	49
14	78	62	140	205	265	327	180	590	289	133	34	51
15	85	61	165	210	270	324	126	572	277	122	39	52
16	76	60	170	205	275	317	132	494	277	114	37	69
17	79	59	140	210	260	320	144	428	279	118	39	67
18	72	59	135	210	270	328	145	357	287	122	43	66
19	67	59	165	210	275	352	234	342	274	95	34	58
20	60	60	195	220	285	378	203	357	253	92	35	53
21	54	61	200	230	295	407	156	373	249	111	37	53
22	51	60	210	250	310	463	117	388	259	105	36	52
23	54	60	215	255	315	506	103	457	245	93	34	47
24	56	60	205	255	300	550	124	608	225	89	35	42
25	56	60	180	235	320	572	153	632	230	82	38	49
26	53	62	180	215	345	525	182	737	293	79	39	47
27	59	64	195	225	345	485	193	728	340	80	36	43
28	54	66	190	225	350	457	182	702	397	76	40	42
29	53	65	190	230	---	432	167	698	361	81	41	32
30	54	68	195	225	---	413	165	635	331	78	37	29
31	52	---	205	225	---	408	---	546	---	79	38	---
TOTAL	1787	1843	4178	6735	7685	12172	5571	15743	9766	4835	1189	1322
MEAN	57.6	61.4	135	217	274	393	186	508	326	156	38.4	44.1
AC-FT	3540	3660	8290	13360	15240	24140	11050	31230	19370	9590	2360	2620
MAX	85	68	215	255	350	572	440	793	510	339	76	69
MIN	42	48	60	200	235	317	103	192	225	76	26	29

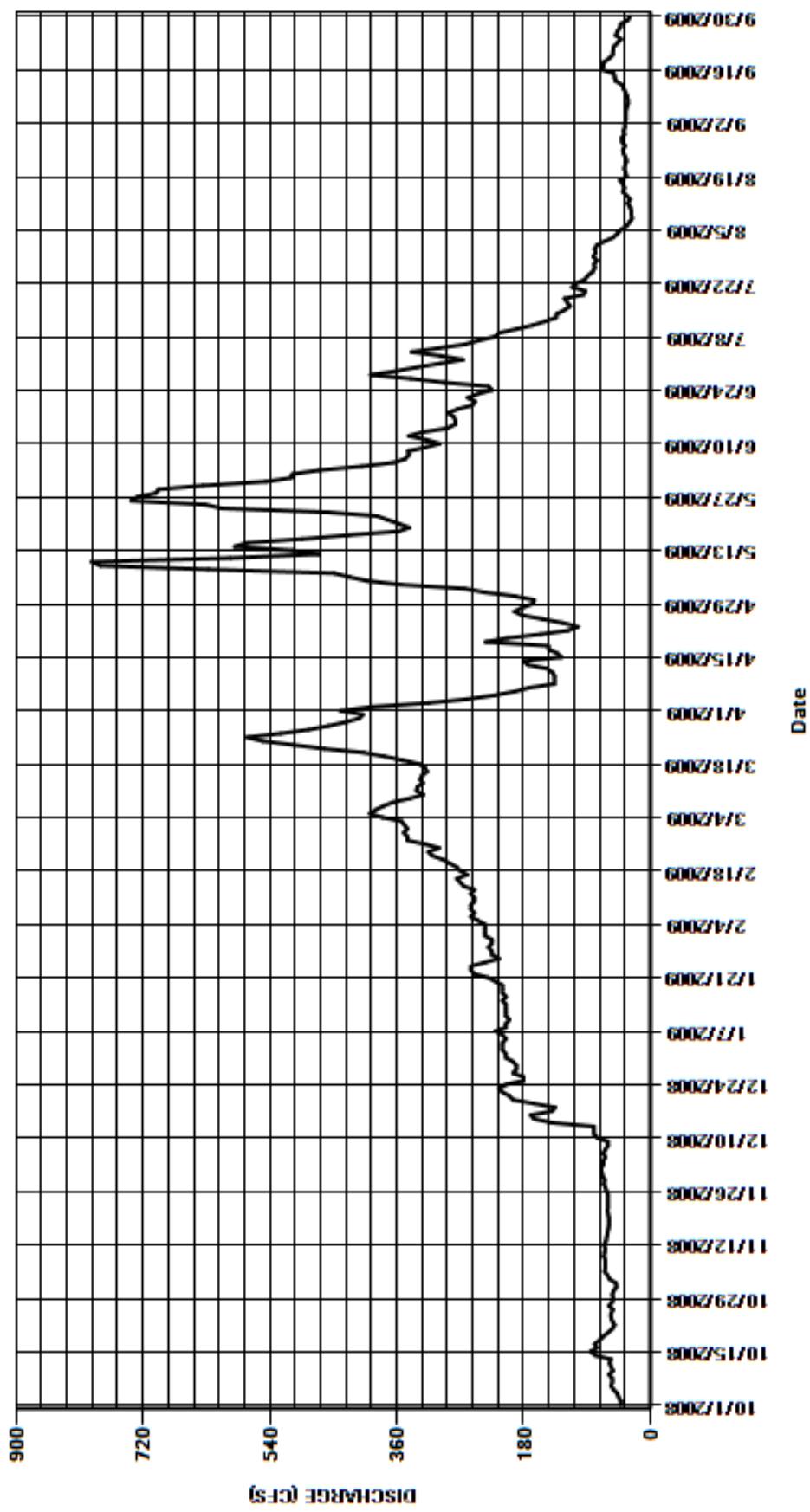
CAL YR	2008	TOTAL	105612	MEAN	289	MAX	1370	MIN	42	AC-FT	209500
WTR YR	2009	TOTAL	72826	MEAN	200	MAX	793	MIN	26	AC-FT	144500

MAX DISCH: 869 CFS AT 05:15 ON May. 10,2009 GH 4.68 FT. SHIFT -0.14 FT.

MAX GH: 4.68 FT. AT 05:15 ON May. 10,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSSES
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH
Water Year 2009

Location.-- Lat. 37°22'16", Long. 105°17'05", UTM X 473880.5, Y 4136484.8, Costilla County, Hydrologic Unit 13010002, in Sangre de Cristo Grant, on right bank 0.9 mi downstream from North Fork, 1.0 mi upstream from Turners Ranch, and 8.3 mi southeast of Fort Garland.

Drainage and Period of Record.-- 45 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 6 ft. by 6 ft. exposed aggregate shelter and 3 ft. concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. A tipping bucket rain gage and air temperature sensor were installed on Sep. 1, 2009.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods when the stage-discharge relation was affected by ice: Nov. 6, 7, 21-26, 29, 30, Dec. 10-31, 2008, Jan. 1-31, Feb. 1-22, 27, 28, Mar. 1, 2, 2009. There were no instrumentation corrections made to the shaft encoder. There were two gage-height corrections, +0.05 and +0.01 feet, due to debris on inlets. There were also two flush corrections of +0.01 feet.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on August 20, 2009 using R.M. No. 4 as base. The RP was within allowable limits, so no corrections were required or made. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 17, Aug. 13, and 26, 2009. An adjustment to instrument collimation was made on Aug. 26, 2009.

Rating.-- The control is a small rock weir approximately 10 feet below the gage. Minor shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating No. 14, in use since Oct. 1, 2006, was used again this year. Fifteen measurements (Nos. 158-172) were made this year ranging in discharge from 7.78 to 80.8 cfs. They cover the discharge range experienced except for higher daily flows on May 13-16, 21-29, 2009; and lower daily flows on Nov. 6-7, Dec. 9-16, 19-29, 2008, Jan. 6-23, 28-31, Feb. 1-6, 8-17, 19, 27, 28, Mar. 1, 27, 2009. The peak flow of 113 cfs occurred at 19:30 on May 21, 2009 at a gage height of 4.44 ft. with a shift of +0.02 ft. It exceeded high measurement No. 166 (GH=4.23 ft.) by 0.21 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied between -0.01 and +0.03 ft. All measurements were given full weight except Nos. 159, 168, 170, 171, and 172 which were adjusted by as much as 4% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice affected record were estimated using three measurements, comparison with nearby station (TRIMTNCO), and weather records. A hydrograph was used.

Remarks.-- Record is good, except for periods of ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH

RATING TABLE--

TRITURCO14 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

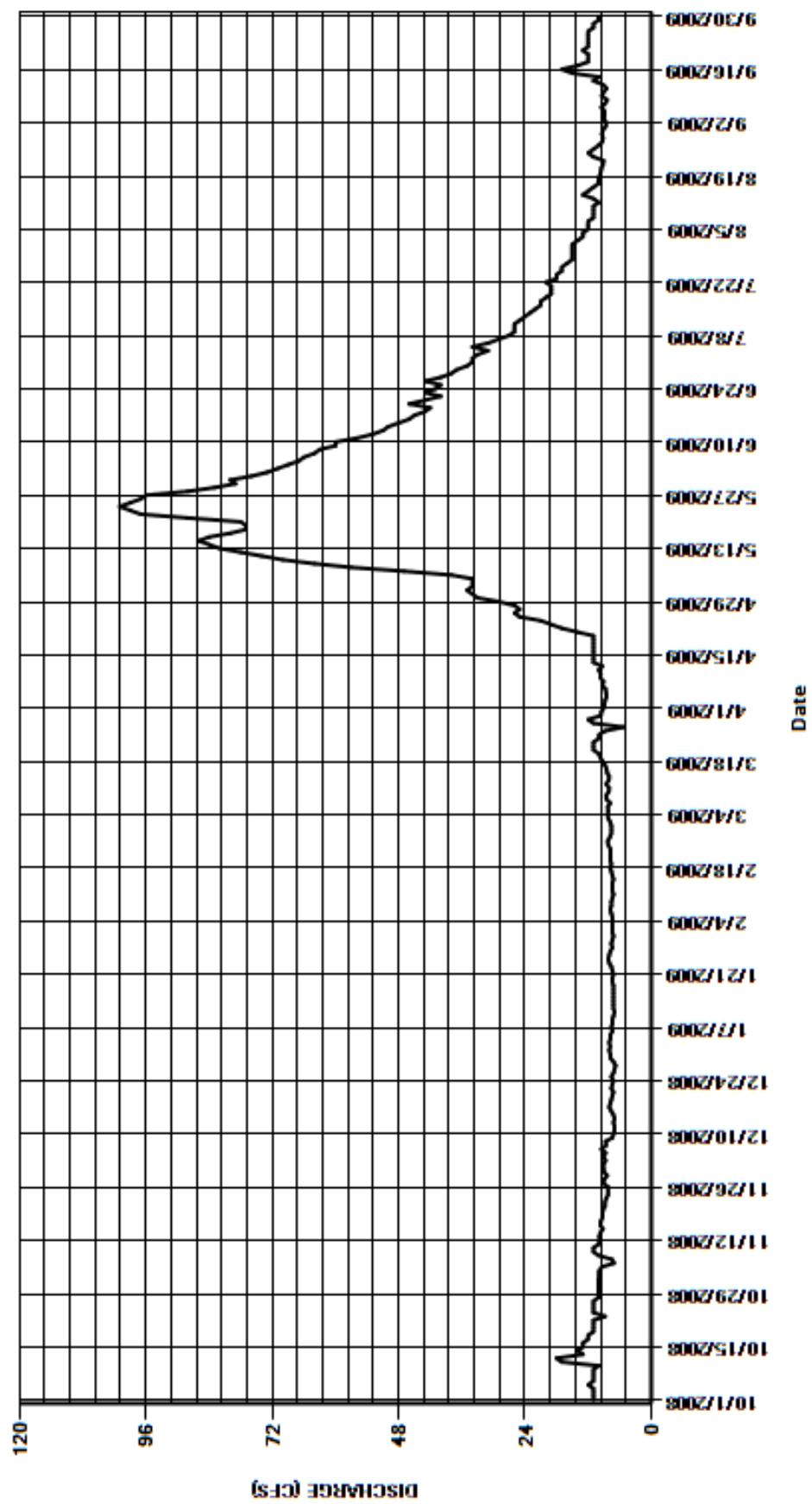
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	10	9.1	8	7.4	7.6	9.1	34	76	34	15	8.7
2	11	10	9.1	7.8	7.4	7.8	8.9	35	73	34	14	8.6
3	11	9.9	8.7	8	7.4	8.2	8.8	34	71	33	13	9
4	11	9.9	9.1	7.8	7.4	8.3	8.5	34	69	31	13	8.9
5	12	9.4	8.7	7.8	7.4	8.2	8.6	34	67	34	12	8.9
6	11	7.1	9.5	7.4	7.6	8.3	8.7	38	66	31	12	9.5
7	11	7.5	8.6	7.6	7.8	7.8	9.3	47	64	29	12	8.8
8	11	10	8.7	7.4	7.6	8.5	9.1	57	63	27	11	8.4
9	11	11	7.4	7.4	7.6	8.6	9.7	64	60	26	11	9.4
10	10	11	7.2	7.2	7.4	8.1	9.6	70	60	26	11	9.1
11	17	10	7	7	7.2	8	10	74	56	26	11	8.5
12	18	9.8	7	7.2	7.4	8.6	9.3	78	53	25	10	9.2
13	13	9.9	7.2	7.2	7.4	8.1	11	82	51	24	11	11
14	14	9.7	7	7.2	7.4	8	11	84	50	23	13	9.9
15	13	9.2	7.2	7.2	7.2	8.4	11	86	48	22	12	15
16	13	9.7	7.6	7.2	7.4	8.5	11	84	46	21	11	17
17	12	9.6	8	7.2	7.6	8.8	11	80	45	21	10	14
18	12	9.3	7.8	7.2	7.8	9.3	11	77	43	20	10	12
19	11	9.3	7.6	7.4	7.6	9.7	11	77	42	19	9.8	12
20	11	9.2	7.4	7.4	7.8	10	11	78	46	19	9.6	12
21	11	8.8	7.2	7.2	7.8	11	14	88	43	19	9.5	13
22	11	8.8	7.6	7.4	7.8	11	17	97	40	20	9.2	12
23	8.8	8.6	7.4	7.6	7.8	11	19	99	43	18	9.1	12
24	11	8.2	7.2	8	8.2	10	21	101	41	18	11	12
25	11	8.2	7.6	8.2	8.3	9.9	25	99	40	17	12	12
26	11	8.2	7.2	8	7.9	8.8	26	97	43	17	11	12
27	11	9.1	7	7.8	7.6	5.3	25	96	40	16	10	11
28	10	9	6.8	7.4	7.6	11	26	88	38	15	9.3	11
29	10	8.4	7.2	7.6	---	12	29	83	37	15	9.2	10
30	10	9	7.8	7.4	---	9.6	33	79	35	15	9.4	10
31	10	---	7.8	7.2	---	9.5	---	80	---	15	9.2	---
TOTAL	358.8	277.8	240.7	232.4	212.8	277.9	432.6	2254	1549	710	340.3	324.9
MEAN	11.6	9.26	7.76	7.5	7.6	8.96	14.4	72.7	51.6	22.9	11	10.8
AC-FT	712	551	477	461	422	551	858	4470	3070	1410	675	644
MAX	18	11	9.5	8.2	8.3	12	33	101	76	34	15	17
MIN	8.8	7.1	6.8	7	7.2	5.3	8.5	34	35	15	9.1	8.4
CAL YR	2008	TOTAL	8308.3	MEAN	22.7	MAX	133	MIN	5	AC-FT	16480	
WTR YR	2009	TOTAL	7211.2	MEAN	19.8	MAX	101	MIN	5.3	AC-FT	14300	

MAX DISCH: 113 CFS AT 19:30 ON May. 21,2009 GH 4.44 FT. SHIFT 0.02 FT.

MAX GH: 4.94 FT. AT 05:30 ON Jan. 31,2009 (Ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR
Water Year 2009

Location.-- Lat. 37°23'40", Long. 105°22'10", UTM X 467322.6, Y 4138726.6, SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, T.31 S., R.71 W., (unsurveyed) Costilla County, Hydrologic Unit 13010002, on right bank of channel, 200 ft. West of road, approximately 1 1/2 miles above dam, 4 miles SE of Fort Garland.

Drainage and Period of Record.-- 61 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 4-ft. diameter corrugated metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods when the stage-discharge relation was affected by ice: Dec. 5, 9-12, 14, 15, 19-22, 24, 26, 27, 2008, Jan. 4-7, 9-22, 27-31, Feb. 1-5, 11-15, 18-22, 2009. There was one +0.01 foot instrument correction made to the shaft encoder on Mar. 25, 2009 that was prorated back to the previous visit. There were also two trash corrections and a flush correction made. The first trash correction made on Oct. 20, 2008, of -0.04 ft. was prorated back to the previous visit. The second trash correction made on Nov. 16, 2008, of -0.07 ft. taken straight back to the +0.07 rise on Nov. 1 assumed to be the trash catching at the gage. The flush correction made on Jun. 25, 2009 of +0.02 ft. prorated back to the G.H. change at 10:30 the same day.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on August 20, 2009 using B.M. No. 1 as base. The RP elevation was within allowable limits; therefore, a correction was not required or made. The new B.M. No. 3 was also established, (Elevation 6.160 ft.) 30 ft. NNW of shelter. Two-peg test was performed on the Lietz level (SN 130869) on August 13, 2009. The test showed instrument was within tolerance, so no adjustment was made.

Rating.-- The control is a concrete weir approximately 15 feet below the gage. Rating No. 7, in use since Oct. 1, 2001 was used again this year. Sixteen measurements (Nos. 848-863) were made this year ranging in discharge from 4.22 to 64.8 cfs. They cover the discharge range experienced except for the higher daily flows on May, 15, 21-30, 2009 and the lower daily flows on Mar. 27, Sep. 5, 7-9, 11, 2009. The peak flow of 91.5 cfs occurred at 22:15 on May 21, 2009 at a gage-height of 1.35 ft with a shift of +0.08 ft. It exceeded high measurement No. 857 (GH = 1.10 ft.), made May 14, 2009, by 0.25 ft. in stage.

Discharge.-- Shifting control method was used during all open water periods. From Feb. 25, 2009 until Sep. 16, 2009 two variable shift curves (TRIMTNVS0901 Feb 25 to May 14; TRIMTNVS0902 May 14 to Sep 16) were utilized. While time-dependent shifting due to shifting sand and gravel in and above gage-pool and at the control was still possible, the variable shift curves were utilized due to the relatively large variations in gage height for the period. Measurements during the water year show shifts varied from -0.05 feet to +0.11 feet. All measurements were given full weight and applied except Nos. 849, 852, 853, 856-859, and 863 which were adjusted as much as 6% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice effect was estimated using one measurement and temperature records.

Remarks.-- Due to continuous change in slope due to scour and fill in and above gage pool which made the concrete weir ineffective as the control, the record should be considered fair except for periods of ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR

RATING TABLE--

TRIMTNCO07 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7	10	8.7	7	9	6.3	8.2	24	63	21	11	4.3
2	7.4	8.9	8.7	6.9	9	6.8	6.7	23	62	22	9.6	4.8
3	6.5	8.7	8.7	6.6	9	6.3	7.7	22	59	23	9.3	4.8
4	7.4	7.8	8.5	6	9	6.6	7.5	22	56	22	9	4.2
5	7.6	7.8	8.5	6	9	6.5	6.6	21	53	24	8.6	3.9
6	7.5	5.3	8.4	5.5	7	6.5	6.6	23	51	22	8.2	4.4
7	7.7	5	8.3	6	7.3	6.5	7.7	29	48	20	7.9	4.1
8	7	6.6	8.3	6.8	6.8	6	7.9	37	47	19	7.7	3.7
9	6.9	7.9	7.5	6.5	7.5	7	8.4	48	45	19	7.7	3.9
10	6.6	8.1	8	6	7.3	6.2	8.3	56	47	19	7.6	4.2
11	8.3	8.1	8	6.5	7	5.9	9.1	60	44	18	6.7	3.9
12	14	7.8	8	7	7	7.1	9	63	40	18	6	4.3
13	8	7.5	8.7	7.5	7	6.8	9.6	65	37	18	7.6	6.2
14	9.3	8.4	7.5	8.5	7	6.2	10	64	36	18	8.7	5.7
15	8.7	7.3	7	8.5	7.5	6.6	9.7	66	34	19	9.3	11
16	9.9	7.6	8	8.5	7.1	6.7	9.7	65	31	16	8.4	13
17	8.9	8.8	8.1	8.5	5.8	7	10	63	31	14	7.8	13
18	7.6	8.3	7.9	9	7	7.3	9.5	62	28	13	7.2	10
19	9.9	8.2	7.5	9	6	7.6	9.3	61	26	13	6.2	9.8
20	9.2	8.1	7	9	6	8	10	62	32	14	5.5	8.5
21	9.3	8.3	7	8.5	6.5	8.3	11	68	31	14	5	9.5
22	8.9	7.9	7	8.5	6.5	8.4	14	79	28	16	4.8	11
23	7.8	8.6	6.8	8.1	6.6	8.6	16	78	29	13	4.8	11
24	9.7	7.1	6.8	8.5	6.9	8	16	75	28	12	5.8	9.9
25	9.3	7.4	6.5	8.4	6.7	8.6	19	75	27	13	7.1	9.5
26	11	8.7	6.5	8.2	6.3	7.6	22	76	31	13	5.6	9.8
27	9.7	8.9	6	8	6.2	3.8	18	77	27	12	5.1	9.8
28	9.6	9	6.8	8.5	5.8	6.8	18	73	25	11	4.8	8.8
29	9.4	8.8	7.5	7.5	---	8.6	21	70	25	11	4.9	8.7
30	8.8	8.9	7.2	8	---	8.8	23	66	23	11	5.2	9.2
31	9.8	---	6.9	8.5	---	7.9	---	63	---	11	5	---
TOTAL	268.7	239.8	236.3	236.0	199.8	219.3	349.5	1736	1144	509	218.1	224.9
MEAN	8.67	7.99	7.62	7.61	7.14	7.07	11.6	56	38.1	16.4	7.04	7.5
AC-FT	533	476	469	468	396	435	693	3440	2270	1010	433	446
MAX	14	10	8.7	9	9	8.8	23	79	63	24	11	13
MIN	6.5	5	6	5.5	5.8	3.8	6.6	21	23	11	4.8	3.7

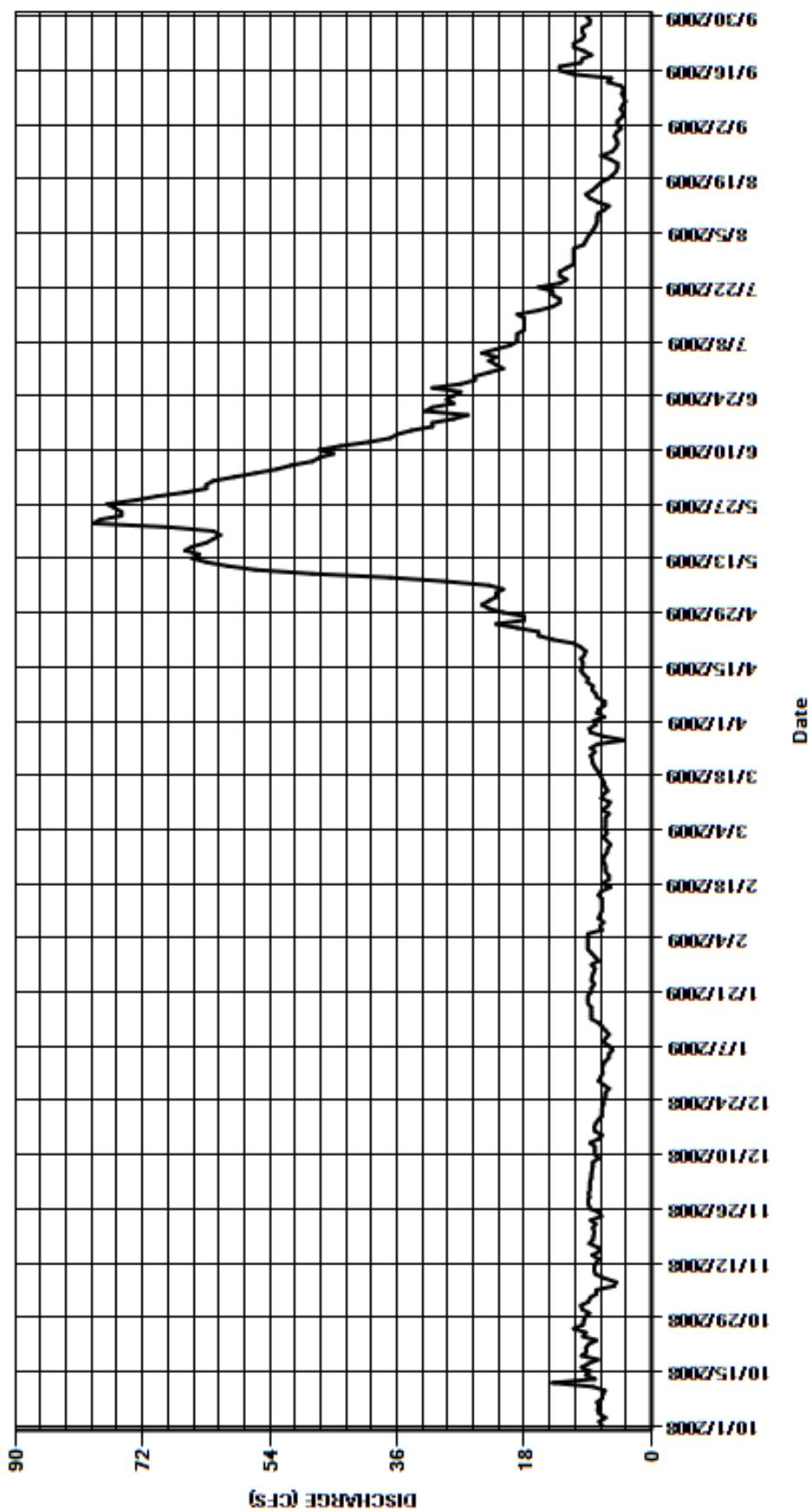
CAL YR	2008	TOTAL	6403.9	MEAN	17.5	MAX	119	MIN	3.5	AC-FT	12700
WTR YR	2009	TOTAL	5581.4	MEAN	15.3	MAX	79	MIN	3.7	AC-FT	11070

MAX DISCH: 92 CFS AT 22:15 ON May. 21,2009 GH 1.35 FT. SHIFT 0.08 FT.

MAX GH: 1.35 FT. AT 22:15 ON May. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOMER RESERVOIR
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND
Water Year 2009

Location.-- Lat. 37°25'30", Long. 105°24'52", UTM X 463280.4, Y 4142102.4, in the SE 1/4 NE 1/4 S. 22, T. 30S, R72W, Costilla County, Hydrologic Unit 13010002, in Sangre de Cristo Grant, on left bank at ice house road bridge, 2,200 ft upstream from Garland Canal, 1.0 mi east of Fort Garland, and 6.3 mi upstream from Ute Creek.

Drainage and Period of Record.-- 190 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 48-inch diameter CMP shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No changes.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and chart record as backups. Record is complete and reliable, except the stage-discharge relation was affected by backwater from a beaver dam below gage on Oct. 4-13, 2008; and the stage-discharge relation was affected by ice Nov. 6-12, 15-20, 22-26, 29, Dec. 5-7, 9-12, 14, 15, 18-24, 26-28, 2008, Jan. 4-22, 27-31, Feb. 1-7, 9, 11-22, 28, 2009. Four instrumentation corrections were made to the shaft encoder during the year ranging from -0.01 to +0.01 feet. These corrections were prorated by time from the previous visit. There were three trash corrections resulting from trash on control. There was also a +0.03 ft. flush correction on Apr. 27, 2009, which was prorated back to previous inflection point.

Datum Corrections.-- Levels were not run at this station this year due to the stability of the gage. Last levels were run on Jul. 16, 2008 with no corrections required.

Rating.-- The control is a concrete weir approximately 14 feet down-stream of the gage. Shifting occurs mainly due to the movement of streambed materials in and above gage pool. At higher flows the channel becomes the control causing considerable shifting. Rating No. 18, in use since Oct. 1, 1979, was used again this year. Seventeen measurements (Nos. 860-876) were made this year ranging in discharge from 0.21 to 90.0 cfs. They cover the discharge range experienced except for lower daily flows on Aug. 4, 5, 7-23, 27-31, Sep. 1-6, 8, 9, 2009 and higher daily flows on April 23-27, May 1-12, 2009. The peak flow of 148 cfs occurred at 17:00 on Apr. 26, 2009 at a gage-height of 3.40 ft with a shift of -0.35 ft. It exceeded high measurement No. 869 (GH = 2.64), made April 27, 2009, by 0.76 ft. in stage.

Discharge.-- Shifting control method was used during all periods of good record. Last year's shift curve was continued for the period of October 1-3, 2008. Another variable shift curve (SANFTGCO0902) was used from Feb. 25, 2009 to June 3, 2009. Two higher measurements from previous water years were used to define the upper end. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts varied from +0.02 to -0.17 feet. All open water measurements were given full weight and applied except for No. 867 which was adjusted 3%, and No. 861, which was rated fair and adjusted 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice affected record was estimated using two discharge measurements, comparison with the nearby stations and weather records. The backwater affected period was estimated using one measured shift and shift estimation from record evaluation. A hydrograph was used.

Remarks.-- Record is good except for periods of backwater affected and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND

RATING TABLE--

SANFTGCO18 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

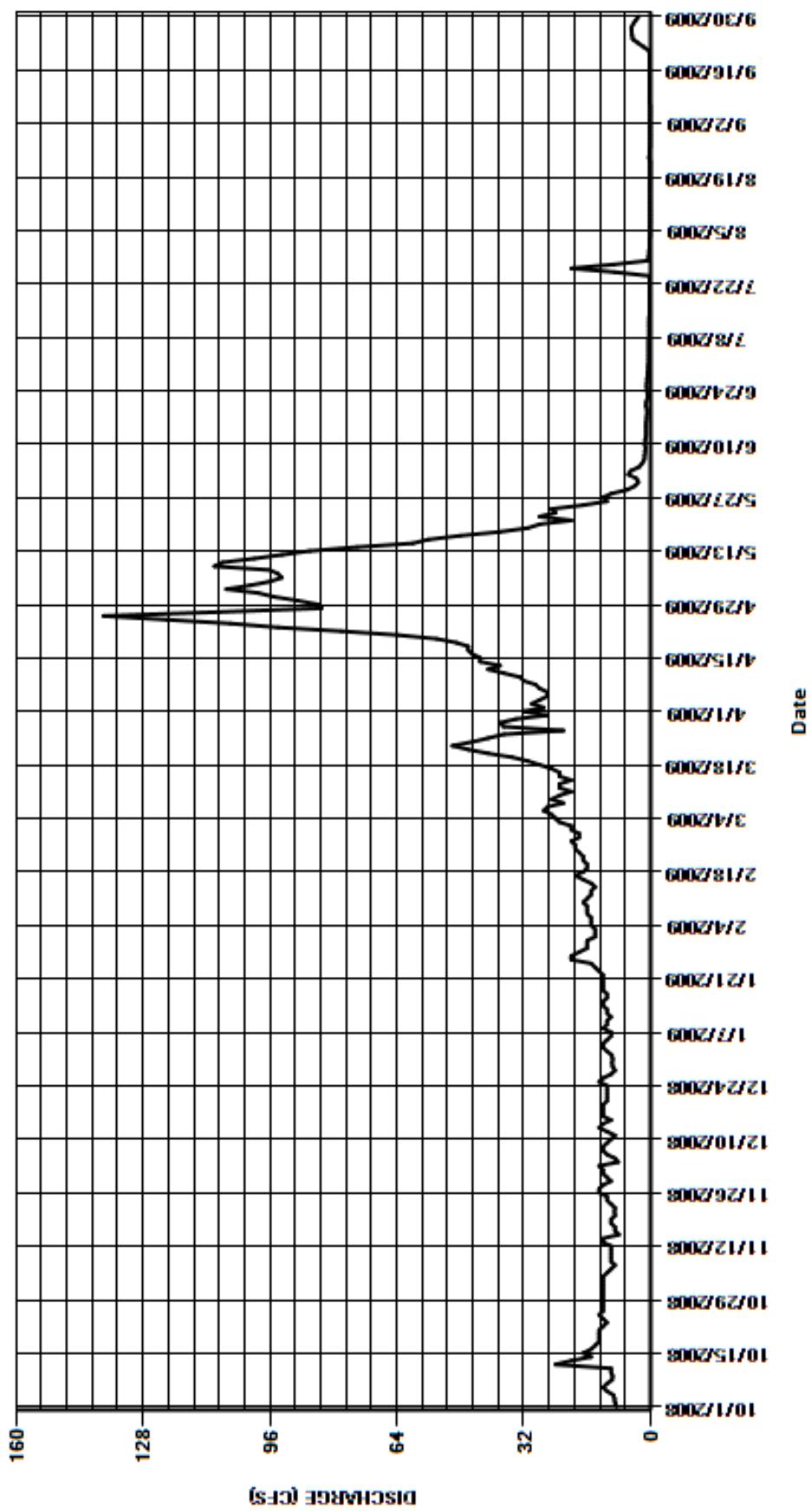
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.6	12	12	9.8	14	20	32	95	3.6	0.58	0.32	0.15
2	9	12	12	11	14	20	27	99	5.6	0.53	0.24	0.16
3	9.1	12	13	12	14	23	30	107	5	0.53	0.22	0.2
4	9.4	12	8.2	12	15	24	28	101	2.9	0.51	0.19	0.18
5	11	11	9	11	15	25	26	96	2.1	0.53	0.19	0.18
6	12	10	11	10	15	27	26	93	1.6	0.5	0.21	0.19
7	11	9	12	10	16	26	28	94	1.5	0.49	0.15	0.21
8	9.7	10	12	12	16	22	29	96	1.4	0.43	0.15	0.2
9	9.6	10	11	11	16	25	32	110	1.3	0.41	0.16	0.2
10	10	10	10	11	17	23	33	108	1.5	0.39	0.16	0.22
11	10	10	9	10	16	20	37	100	1.4	0.46	0.18	0.23
12	24	10	11	11	15	23	41	93	1.2	0.43	0.17	0.23
13	20	12	13	11	15	23	38	86	1.2	0.38	0.18	0.24
14	15	12	12	12	14	20	43	74	1.2	0.32	0.18	0.24
15	17	8	10	12	15	23	43	60	1.2	0.28	0.19	0.33
16	15	9	12	11	17	23	45	56	1.1	0.26	0.19	0.3
17	14	9	12	11	19	25	46	48	1	0.25	0.16	0.3
18	13	10	12	12	17	28	46	38	0.94	0.25	0.16	0.26
19	13	10	12	12	16	31	49	31	0.93	0.24	0.15	0.25
20	13	9	11	12	16	35	54	28	1.2	0.23	0.15	0.26
21	13	9.1	11	12	17	41	64	20	1.1	0.24	0.15	0.45
22	12	9	11	12	17	46	78	28	0.83	0.26	0.14	1.8
23	11	10	11	13	18	50	94	24	0.79	0.25	0.14	3.2
24	12	11	11	14	19	45	106	25	0.94	0.23	0.41	4.5
25	13	11	13	15	19	41	122	17	1	9	0.24	4.7
26	12	13	12	20	20	37	138	11	0.98	20	0.23	4.8
27	12	13	10	20	18	22	109	12	0.91	9.3	0.19	4.9
28	12	12	9	18	18	37	83	10	0.78	0.78	0.17	4.4
29	12	10	9.6	16	---	38	84	6	0.73	0.51	0.17	3.7
30	12	11	9.7	16	---	34	89	4	0.61	0.44	0.15	3
31	12	---	9.6	16	---	26	---	3.1	---	0.35	0.17	---
TOTAL	386.4	316.1	341.1	395.8	458	903	1700	1773.1	46.54	49.36	5.86	39.98
MEAN	12.5	10.5	11	12.8	16.4	29.1	56.7	57.2	1.55	1.59	0.19	1.33
AC-FT	766	627	677	785	908	1790	3370	3520	92	98	12	79
MAX	24	13	13	20	20	50	138	110	5.6	20	0.41	4.9
MIN	8.6	8	8.2	9.8	14	20	26	3.1	0.61	0.23	0.14	0.15
CAL YR	2008	TOTAL	8720.5	MEAN	23.8	MAX	101	MIN	4	AC-FT	17300	
WTR YR	2009	TOTAL	6415.24	MEAN	17.6	MAX	138	MIN	0.14	AC-FT	12720	

MAX DISCH: 148 CFS AT 17:00 ON Apr. 26,2009 GH 3.4 FT. SHIFT -0.35 FT.

MAX GH: 3.4 FT. AT 17:00 ON Apr. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08242500 UTE CREEK NEAR FORT GARLAND
Water Year 2009

Location.-- Lat. 37°26'50", Long. 105°25'33", UTM X 462334.0, Y 4144571.1, in the S 1/2 S. 10, T. 30S, R. 72W, Costilla County, Hydrologic Unit 13010002, on left bank 1.5 mi north of Fort Garland, and 6 mi upstream from mouth.

Drainage and Period of Record.-- 32 mi². Staff gage established on weir Mar. 1915 and operated to Oct. 1916. Continuous record from May 1923 to present at various locations close to present site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping bucket rain gage in a 4 ft CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. There is an outside staff gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 18 – Dec. 3, 2008, Mar. 27-31, Apr. 1, 2, 5, 6, 2009 when floats were affected by ice in well; and Dec. 4, 2008 through Mar. 25, 2009 when the station was closed for the winter.

Datum Corrections.-- Levels were run to the Reference point inside the gage October 26, 2009 using R.M. No. 1 as base. The gage reference point elevation was corrected -0.026 ft. Datum correction was run from the station opening on March 25, 2009 through the end of the water year. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- The control is a concrete broad crested weir approximately 10 feet below the gage. Shifting occurs mainly due to the movement of streambed materials into the gage pool. Rating No. 18, created Sep. 13, 2008, was used this water year. Sixteen measurements (Nos. 205-220) were made this year ranging in discharge from 3.42 to 95.6 cfs. They cover the flows experienced except for the lower daily flows on Dec. 29, 30, 2008, and the higher daily flows on May 13, 14, 19-22, and Jun. 26, 2009. The peak flow of 183 cfs occurred at 00:15 on June 26, 2009 at a gage-height of 3.10 feet (GH Corr. +0.03 ft applied) with a shift of -0.06 feet. It exceeded high measurement No. 214 (GH = 2.62), made May 14, 2009 by 0.48 feet in stage.

Discharge.-- Shifting control method was used for all open water periods. A variable shift curve was used from May 14, 2009 until the end of the water year. Measurements show shifts varying between -0.01 and -0.09 ft. All measurements were given full weight except No. 207, which was not used, and Nos. 215, and 217-220 which were adjusted by as much as 8% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five measurements and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height which is estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08242500 UTE CREEK NEAR FORT GARLAND

RATING TABLE--

UTEFTGCO18 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

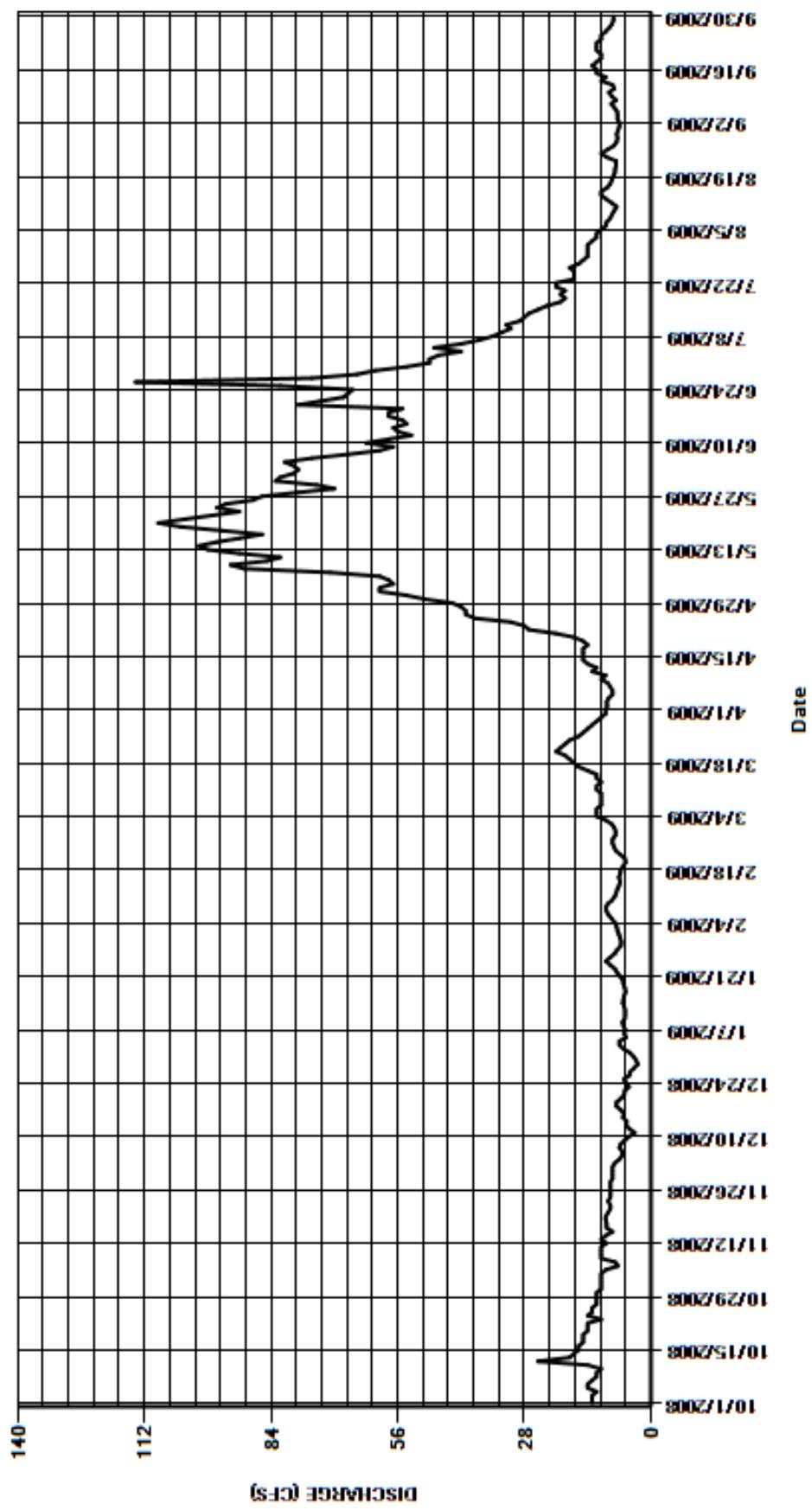
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	11	8.5	4.7	7.1	8.1	10	54	82	49	14	7
2	13	11	8.5	6.1	7.4	8.7	9.7	60	79	49	13	7
3	13	11	8	7	7.6	10	9.8	60	78	47	12	7.4
4	12	11	7	7	7.9	12	9.4	57	79	42	12	7.4
5	14	10	6.4	5.5	8.6	12	8.5	58	81	48	11	7.5
6	14	7.3	6.3	5.9	9.3	12	8.5	60	75	42	10	8.1
7	13	7.9	7	5.7	9.8	11	9	71	67	38	9.8	8.8
8	12	11	6.7	6.1	10	11	9.6	90	60	35	9	7.7
9	12	11	5.8	6.3	9.6	11	11	93	57	33	8.6	8.7
10	11	11	4.8	5.8	8.6	11	10	85	63	31	8.1	9.3
11	14	11	3.6	5.7	8	12	13	82	58	32	7.6	8.1
12	25	9.9	4.8	5.7	7.7	12	12	91	53	29	8.7	8.5
13	18	11	5.5	5.9	7.4	11	14	98	56	28	9.9	11
14	17	10	5.4	6.2	7	12	15	100	57	27	11	10
15	16	8.5	6.2	6.1	6.8	12	15	96	54	25	11	12
16	16	9.8	6	5.9	7.1	14	15	91	55	23	9.7	12
17	15	9.8	6.7	5.6	6.8	16	15	86	58	20	9	13
18	15	10	7.7	5.8	6.7	17	14	95	58	19	8.7	12
19	15	10	7.6	6.1	6.1	18	15	104	55	20	8.3	11
20	14	9.5	6.6	6.2	5.6	19	17	109	78	19	8	11
21	14	9	5.9	6.8	5.8	21	21	103	73	21	7.9	12
22	14	9	5.8	7.5	6.8	20	27	97	68	21	7.7	12
23	11	9.5	4.9	8	7.8	19	28	91	67	17	7.7	12
24	14	9	5.5	9	8.2	18	31	96	66	17	9.8	11
25	13	9	6	10	8.5	16	39	94	82	17	11	11
26	13	9	4.8	9	8.5	15	41	88	114	18	9.6	10
27	12	9	4.6	8	7.9	14	41	86	75	16	8.2	9.2
28	12	9	3.7	7.5	7.8	13	42	78	65	15	7.6	8.6
29	12	8.5	2.9	6.7	---	12	44	70	61	14	7.4	8.3
30	12	8.5	3.3	6.6	---	11	50	74	54	14	7.6	8.3
31	11	---	3.9	6.8	---	10	---	83	---	14	7.3	---
TOTAL	430	291.2	180.4	205.2	216.4	418.8	604.5	2600	2028	840	291.2	289.9
MEAN	13.9	9.71	5.82	6.62	7.73	13.5	20.1	83.9	67.6	27.1	9.39	9.66
AC-FT	853	578	358	407	429	831	1200	5160	4020	1670	578	575
MAX	25	11	8.5	10	10	21	50	109	114	49	14	13
MIN	11	7.3	2.9	4.7	5.6	8.1	8.5	54	53	14	7.3	7
CAL YR	2008	TOTAL	9452.4	MEAN	25.8	MAX	118	MIN	2.9	AC-FT	18750	
WTR YR	2009	TOTAL	8395.6	MEAN	23	MAX	114	MIN	2.9	AC-FT	16650	

MAX DISCH: 183 CFS AT 00:15 ON Jun. 26,2009 GH 3.1 FT. SHIFT -0.06 FT. (GH CORR. +0.03 FT. APPLIED)

MAX GH: 3.1 FT. AT 00:15 ON Jun. 26,2009 (GH CORR. +0.03 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08242500 UTE CREEK NEAR FORT GARLAND
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR
Water Year 2009

Location.-- Lat. 37°23'10", Long. 105°33'02", UTM X 451212.0, Y 4137849.6, in sec. 4, T.31 S., R.73 W., (unsurveyed), Costilla County, Hydrologic Unit 13010002, on right bank of channel, 0.6 mi downstream from Smith Reservoir, and 5.0 mi southwest of Blanca, CO

Drainage and Period of Record.-- 396 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 42 inch diameter corrugated metal shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of fifteen minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Sep. 10–30, 2009 when inlets were plugged and buried with silt due to the reservoir being drained for gate repair. Two instrument corrections to the shaft encoder were made this year; a +0.03 ft. on Nov. 6, 2008, and a -0.01 ft. on Feb. 25, 2009. Both were prorated from previous visits.

Datum Corrections.-- Levels were run to the Reference Point inside the gage on Aug. 20, 2009 using BM No. 1 as base. The reference point elevation was outside allowable limits, so the RP was raised 0.024 feet. A gage-height correction of -0.02 feet was applied from Mar. 27 to Aug. 20, 2009 when the RP/Datum elevation was corrected. Also the new BM No. 5 was established at an elevation of 5.957 ft. A two-peg test was performed on the Lietz level (SN 130869) on Aug. 13, 2009. The test showed instrument was within tolerance, so no adjustment was made.

Rating.-- The control is a concrete weir approximately 5 feet downstream of the gage. Shifting occurs mainly due to moss growth and the movement of streambed materials in gage pool and approach. Rating No. 11, in use since Oct. 1, 1987, was used again this year. Sixteen measurements (Nos. 835-850) were made this year ranging in discharge from 0.78 to 130 cfs. They cover the range experienced except for the lower daily flows on Oct. 9-15, 17-25, 2008. The peak flow of 132 cfs occurred at 09:30 on Apr. 25, 2009 at a gage-height of 4.03 ft. (GH corr. -0.02 ft applied) with a shift of +0.25 feet. It exceeded high measurement No. 843 made on Apr. 27, 2009 (GH = 4.02 ft. (GH corr. -0.02 ft applied)) by 0.01 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. Two variable shift curves were used to apply shifts according to stage. Last year's shift curve was used from Oct. 1-8, 2008. Another shift curve was used from Feb. 25 to Sep. 7, 2009. During other periods, shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied from -0.02 to +0.25 feet. All measurements were given full weight except Nos. 841, 842, 844, 846, 848, and 849 which were adjusted by as much as 4% and 845, rated fair, was adjusted 7% to smooth shift distribution.

Special Computations.-- Discharge for period of no gage-height record was estimated using one discharge measurement, partial day records, and data trend before the period.

Remarks.-- Record is good except for periods of no gage-height record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR

RATING TABLE--

TRISMICO11 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

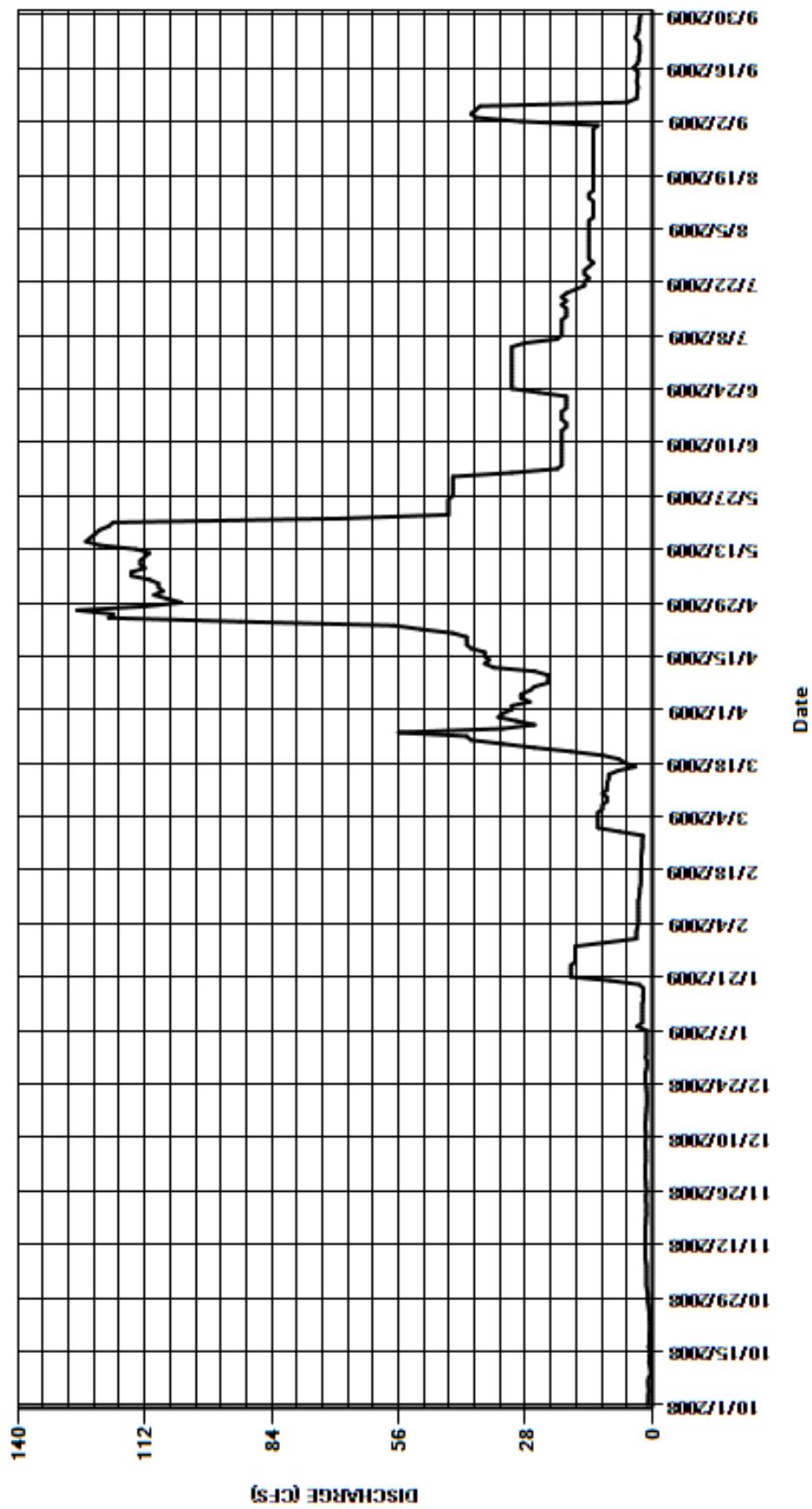
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.1	1.3	1.5	1.3	3.5	12	31	110	44	31	14	12
2	0.89	1.3	1.5	1.3	3.5	12	31	108	31	31	14	29
3	0.89	1.3	1.5	1.3	3.3	12	27	109	21	31	14	39
4	0.86	1.3	1.4	1.3	3.1	12	29	109	20	31	14	40
5	0.81	1.3	1.4	1.3	3.1	12	29	111	20	31	14	39
6	0.88	1.3	1.4	1.3	3.1	11	27	115	20	28	14	38
7	0.96	1.4	1.5	1.3	3.1	11	26	115	20	21	14	5.6
8	0.81	1.5	1.5	3.4	3.1	10	23	112	20	20	13	3.5
9	0.35	1.5	1.5	2.2	3.1	10	23	113	20	20	13	3.4
10	0.4	1.5	1.4	2.2	3.1	11	23	113	20	20	13	3.3
11	0.51	1.5	1.4	2.2	2.9	10	26	112	20	20	13	3.2
12	0.76	1.5	1.5	2.2	2.8	10	35	111	20	20	13	3.4
13	0.69	1.6	1.5	2.2	2.8	9.9	37	114	20	19	14	3.4
14	0.64	1.6	1.5	2.2	2.6	9.6	36	122	19	19	14	3.2
15	0.54	1.6	1.4	2	2.5	9.6	37	125	19	19	13	3.2
16	0.81	1.5	1.4	2.1	2.5	7.5	37	124	20	20	13	4.2
17	0.7	1.5	1.3	2	2.5	3.8	40	123	20	19	13	3.4
18	0.68	1.4	1.3	2	2.5	6	41	122	20	20	13	3
19	0.64	1.4	1.2	2.9	2.4	7.4	41	120	19	19	13	3
20	0.63	1.3	1.2	9.3	2.4	11	41	119	19	17	13	2.8
21	0.55	1.4	1.2	18	2.5	18	44	69	19	15	13	2.8
22	0.55	1.3	1.3	18	2.4	26	51	45	19	15	13	2.8
23	0.62	1.4	1.3	18	2.3	33	57	45	25	14	13	3
24	0.7	1.4	1.5	18	2.2	40	91	45	31	15	13	3.8
25	0.71	1.4	1.5	17	2.2	41	120	45	31	15	13	3.2
26	0.78	1.3	1.5	17	2.2	56	119	45	31	14	13	3
27	0.87	1.4	1.5	17	2.1	33	127	44	31	13	13	3
28	1	1.4	1.3	17	7.2	26	112	44	31	14	13	2.8
29	0.99	1.5	1.2	17	---	30	104	44	31	14	13	2.8
30	1	1.5	1.2	10	---	34	107	44	31	14	13	2.5
31	1.2	---	1.5	3.5	---	33	---	44	---	14	13	---
TOTAL	23.52	42.6	43.3	216.5	81.0	567.8	1572	2821	712	613	412	275.3
MEAN	0.76	1.42	1.4	6.98	2.89	18.3	52.4	91	23.7	19.8	13.3	9.18
AC-FT	47	84	86	429	161	1130	3120	5600	1410	1220	817	546
MAX	1.2	1.6	1.5	18	7.2	56	127	125	44	31	14	40
MIN	0.35	1.3	1.2	1.3	2.1	3.8	23	44	19	13	13	2.5
CAL YR	2008	TOTAL	5384.85	MEAN	14.7	MAX	63	MIN	0.35	AC-FT	10680	
WTR YR	2009	TOTAL	7380.02	MEAN	20.2	MAX	127	MIN	0.35	AC-FT	14640	

MAX DISCH: 132 CFS AT 09:30 ON Apr. 25,2009 GH 4.03 FT. SHIFT 0.25 FT. (GH CORR. -0.02 FT. APPLIED)

MAX GH: 4.03 FT. AT 09:30 ON Apr. 25,2009 (GH CORR. -0.02 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR
Water Year 2009

Location.-- Lat. 37°21'18", Long. 106°32'37", UTM X 363239.8, Y 4135373.7, Conejos County, Hydrologic Unit 13010005, on left bank 1,100 ft downstream from valve house for Platoro Reservoir and 0.7 mi northwest of Platoro.

Drainage and Period of Record.-- 40 mi². 1937 – 1953 at site one mile downstream. May 1952 to current year at present site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio) and a float-operated shaft encoder, and air temperature sensor in a timber shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 150 feet below gaging station. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Oct. 31, 2008 through Apr. 14, 2009 when the station was closed for the winter. From Apr. 14 through May 6, 2009, the gage-height was affected by snowmelt from around gage flowing into the well faster than lower inlet could expel it. There were no instrumentation corrections made to the shaft encoder during the year.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on August 18, 2009, using B.M. 1 as base. The RP was within allowable limits, so no correction was made or required. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- A concrete slab weir with sloping sides acts as the control. Rating No. 13, in use since January 1, 2002, was used again from Oct. 1, 2008 until Apr. 14, 2009, when the station was reopened for the irrigation season. Rating No. 14 was developed and used for the remainder of the water year. This rating is well defined from 4 to 825 cfs. Eleven measurements (Nos. 856-866) were made this year ranging in discharge from 7.56 to 825 cfs. Measurements cover the discharge range experienced. The peak flow 832 cfs occurred at 11:45 on June 26, 2009 at a gage height of 3.46 ft. with a shift of 0.00 ft. It exceeded high measurement No. 862 (GH = 3.45) by 0.01 ft. in stage.

Discharge.-- Shifting control method was used during all periods of good record. A shift curve was used to apply shifts according to stage from Oct. 1 to Oct. 31, 2008, when the station was closed for winter. During other open water periods, using the new rating, shifts were applied as defined by discharge measurements and distributed by time. Measurements while using rating No. 13 show shifts varied between -0.02 and 0 feet. Measurements while using rating No. 14 show shifts varied between -0.01 and +0.02 feet. All measurements were given full weight and applied except numbers 863 and 865, which were adjusted as much as 3 percent to smooth shift distribution.

Special Computations.-- Discharge for the period of no gage-height record was estimated based on two measurements and partial day records. A winter estimation hydrograph was not used since flow is controlled by Platoro Reservoir and there were no reservoir gate adjustments made while the station was closed. Discharge for the period Apr 14 to May 6 when gage-height was not representative of average was estimated based on two measurements and partial day records.

Remarks.-- Record is good, except for period of no gage-height record, which is rated fair since the gage is directly below a reservoir and gate changes were not made during the period; and the period of Apr. 14 through May 6, 2009, which is considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR

RATING TABLE--

CONPLACO13 USED FROM 01-Oct-2008 TO 14-Apr-2009
CONPLACO14 USED FROM 14-Apr-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

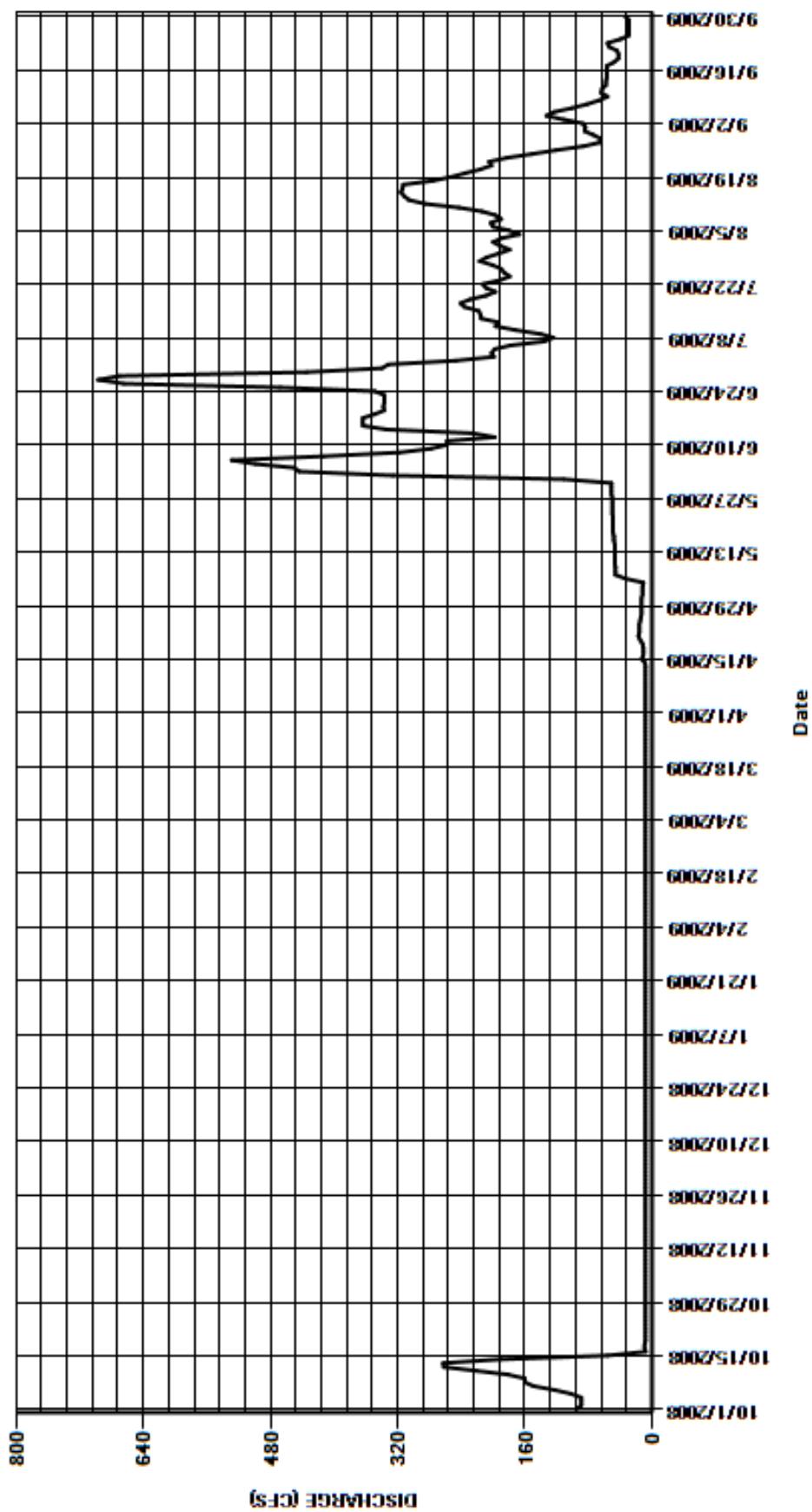
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	95	8.1	8.1	8.1	8.1	8.1	8.1	13	111	332	191	84
2	89	8.1	8.1	8.1	8.1	8.1	8.1	12	326	247	200	87
3	89	8.1	8.1	8.1	8.1	8.1	8.1	12	444	199	189	111
4	89	8.1	8.1	8.1	8.1	8.1	8.1	12	450	202	167	133
5	102	8.1	8.1	8.1	8.1	8.1	8.1	11	499	198	180	123
6	123	8.1	8.1	8.1	8.1	8.1	8.1	33	529	178	200	101
7	149	8.1	8.1	8.1	8.1	8.1	8.1	46	413	136	203	82
8	160	8.1	8.1	8.1	8.1	8.1	8.1	46	318	124	190	67
9	160	8.1	8.1	8.1	8.1	8.1	8.1	46	278	141	197	56
10	181	8.1	8.1	8.1	8.1	8.1	8.1	47	258	172	214	64
11	221	8.1	8.1	8.1	8.1	8.1	8.1	47	258	197	243	63
12	262	8.1	8.1	8.1	8.1	8.1	8.1	47	198	193	286	58
13	263	8.1	8.1	8.1	8.1	8.1	8.1	47	225	215	306	58
14	190	8.1	8.1	8.1	8.1	8.1	8.7	47	334	216	312	57
15	56	8.1	8.1	8.1	8.1	8.1	13	47	364	218	316	57
16	8.1	8.1	8.1	8.1	8.1	8.1	11	48	364	236	314	57
17	9.5	8.1	8.1	8.1	8.1	8.1	11	48	364	241	313	57
18	9.2	8.1	8.1	8.1	8.1	8.1	11	49	349	229	276	48
19	8.1	8.1	8.1	8.1	8.1	8.1	12	49	337	209	253	42
20	8.1	8.1	8.1	8.1	8.1	8.1	15	49	338	197	235	42
21	8.1	8.1	8.1	8.1	8.1	8.1	17	49	337	209	216	44
22	8	8.1	8.1	8.1	8.1	8.1	16	49	337	213	202	54
23	8.1	8.1	8.1	8.1	8.1	8.1	16	50	337	192	205	56
24	8.1	8.1	8.1	8.1	8.1	8.1	16	50	349	179	183	40
25	8.1	8.1	8.1	8.1	8.1	8.1	15	50	468	186	151	29
26	8.1	8.1	8.1	8.1	8.1	8.1	14	50	665	190	121	29
27	8.1	8.1	8.1	8.1	8.1	8.1	13	50	697	201	87	29
28	8.1	8.1	8.1	8.1	8.1	8.1	13	51	670	217	66	29
29	8.1	8.1	8.1	8.1	---	8.1	13	51	435	208	64	29
30	8.1	8.1	8.1	8.1	---	8.1	13	51	340	193	74	34
31	8.1	---	8.1	8.1	---	8.1	---	51	---	179	85	---
TOTAL	2361.0	243.0	251.1	251.1	226.8	251.1	333.0	1308	11392	6247	6239	1820
MEAN	76.2	8.1	8.1	8.1	8.1	8.1	11.1	42.2	380	202	201	60.7
AC-FT	4680	482	498	498	450	498	661	2590	22600	12390	12380	3610
MAX	263	8.1	8.1	8.1	8.1	8.1	17	51	697	332	316	133
MIN	8	8.1	8.1	8.1	8.1	8.1	8.1	11	111	124	64	29
CAL YR	2008	TOTAL	37021.3	MEAN	101	MAX	514	MIN	8	AC-FT	73430	
WTR YR	2009	TOTAL	30923.1	MEAN	84.7	MAX	697	MIN	8	AC-FT	61340	

MAX DISCH: 832 CFS AT 11:45 ON Jun. 26,2009 GH 3.46 FT. SHIFT 0 FT.

MAX GH: 3.46 FT. AT 11:45 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08245000 CONEJOS RIVER BELOW PLATERO RESERVOIR
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08246500 CONEJOS RIVER NEAR MOGOTE
Water Year 2009

Location.-- Lat. 37°03'14", Long. 106°11'13", UTM X 394411.1, Y 4101511.0, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, T.33 N., R.7 E., Conejos County, Hydrologic Unit 13010005, on left bank 75 ft downstream from bridge on State Highway 174, 0.4 mi downstream from Fox Creek, 5.3 mi west of Mogote, and 10 mi west of Antonito.

Drainage and Period of Record.-- 282 mi². Intermittent, non-recording data from 1903-1915 at various sites. Water stage recorder from 1915-Oct. 1988 at different site. Oct. 1988-present, water stage recorder at current site.

Equipment.-- Graphic water stage recorder and Sutron HDR DCP and float activated shaft encoder in a 5 ft. metal shelter and well. Air temperature sensor and tipping bucket rain gage also monitored by DCP. The primary reference gage is a drop tape from reference point on shelf. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Jan. 23, 2009 through Feb. 2, 2009 when floats were affected by ice in well. The stage-discharge relation was affected by ice Nov. 30, Dec. 1, 10-31, 2008, Jan. 1-22, 2009.

Datum Corrections.-- Levels were not run to the Reference Point (RP) inside the gage this year due to the stability of benchmarks and RP observed during levels in previous years.

Rating.-- Low flow control is a cobblestone riffle approximately fifty feet below the gage. Middle to high flows are channel control. Rating No. 13, in use since March 3, 2008, was used for the entire water year. It is well defined from 10 to 2100 cfs. The rating was extended to 9200 cfs using the high end of the results of a cooperative rating curve extension project with the USGS in 2002. Twenty-seven measurements (Nos. 147-173) were made this year ranging in discharge from 24.9 to 1,660 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 9-15, 2009. The peak flow of 1980 cfs occurred at 04:00 on May 12, 2009 at a gage-height of 5.18 feet with a shift of +0.01 feet. It exceeded high measurement No. 163 (GH=4.82), made May 11, 2009 by 0.36 feet in stage.

Discharge.-- Shifting control method was used. Shifts were distributed by stage using one variable shift curve during the period of Oct. 1, 2008 to Nov. 9, 2009. Shifts were distributed by time proration for the remainder of the water year. Measurements show shifts varied from -0.07 to +0.08 feet. All were given full weight except for Nos. 157, 162, 164, 166, 167, and 168 which were adjusted as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice-affected record was estimated using seven measurements, weather records, partial day record, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice-affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08246500 CONEJOS RIVER NEAR MOGOTE

RATING TABLE--

CONMOGCO13 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

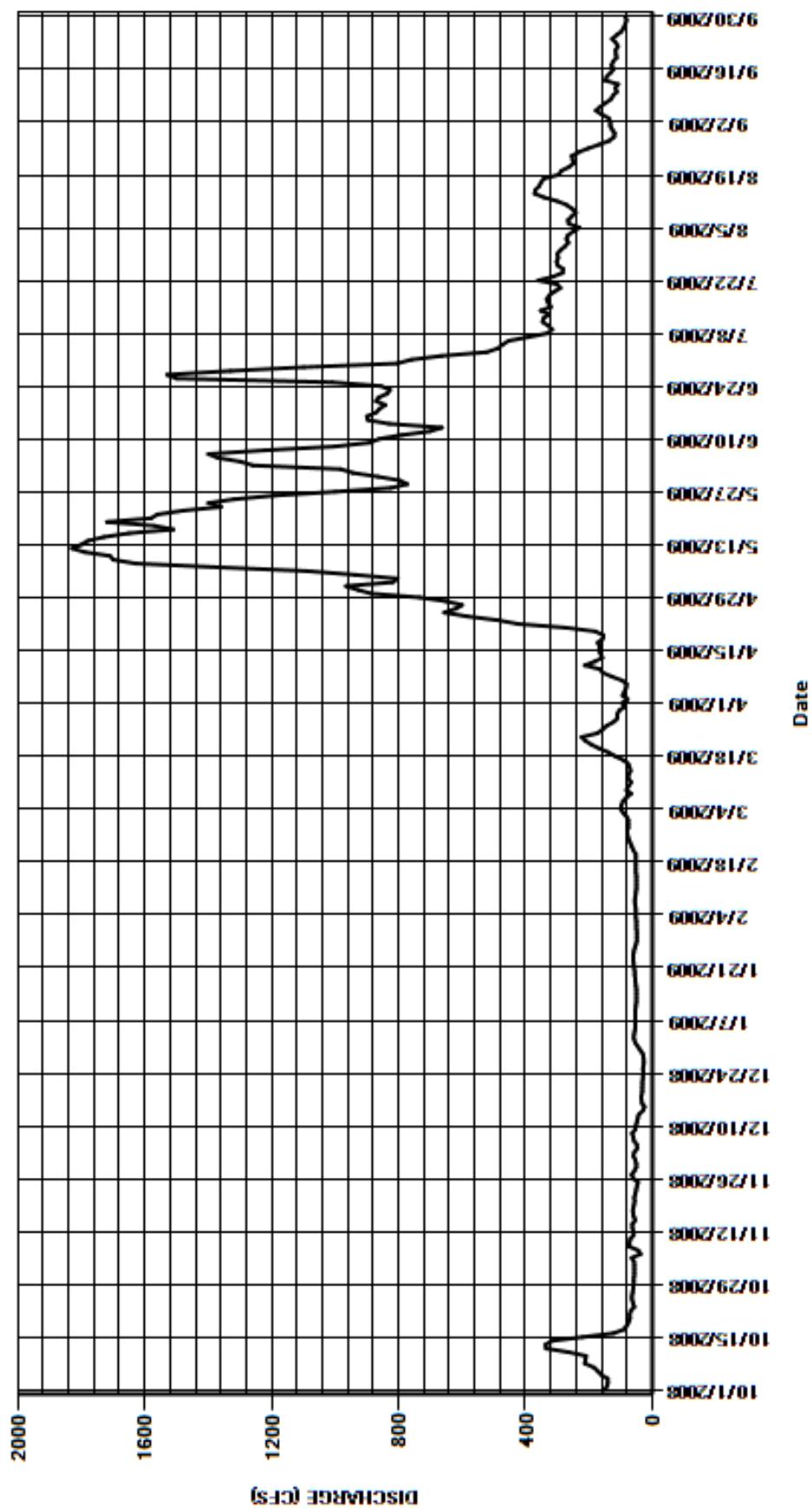
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	152	57	54	54	50	76	95	928	944	760	265	133
2	143	57	60	58	50	82	78	966	983	665	271	132
3	140	57	57	58	52	93	94	819	1260	522	266	138
4	141	58	48	56	52	100	88	803	1300	487	249	160
5	161	65	49	54	52	97	83	937	1370	472	230	178
6	172	37	58	53	53	93	81	1090	1400	453	264	164
7	185	45	60	53	55	82	95	1370	1220	390	266	148
8	213	73	64	54	55	67	127	1630	1000	330	254	131
9	211	72	54	54	53	82	156	1700	891	316	241	124
10	209	70	52	53	52	75	166	1710	861	328	253	112
11	264	59	49	52	50	67	213	1790	791	346	270	117
12	335	60	46	50	50	76	182	1830	701	343	300	108
13	337	63	43	50	50	76	158	1800	664	325	342	149
14	318	63	30	50	50	69	163	1780	830	352	371	144
15	220	54	25	50	52	72	168	1730	897	320	369	132
16	123	59	33	52	52	77	165	1650	900	328	357	122
17	90	61	34	53	52	94	172	1510	871	333	351	129
18	81	61	34	54	52	119	157	1570	860	326	342	124
19	75	58	32	56	52	140	154	1720	842	310	295	113
20	71	56	32	56	52	167	180	1580	871	290	288	115
21	72	57	31	58	60	192	274	1560	863	301	264	116
22	68	54	31	59	65	211	425	1480	836	360	249	109
23	57	51	30	60	70	223	490	1360	827	313	251	115
24	61	49	28	60	75	174	585	1400	856	283	254	127
25	64	45	30	59	78	157	656	1320	1010	281	232	113
26	64	60	28	56	80	144	620	1190	1500	299	202	97
27	62	65	27	52	76	122	600	1000	1530	302	168	90
28	60	57	28	49	76	110	651	825	1330	297	136	85
29	59	51	30	49	---	111	735	773	1100	300	121	81
30	59	51	38	49	---	105	885	797	804	290	119	86
31	58	---	46	50	---	88	---	865	---	276	127	---
TOTAL	4325	1725	1261	1671	1616	3441	8696	41483	30112	11298	7967	3692
MEAN	140	57.5	40.7	53.9	57.7	111	290	1338	1004	364	257	123
AC-FT	8580	3420	2500	3310	3210	6830	17250	82280	59730	22410	15800	7320
MAX	337	73	64	60	80	223	885	1830	1530	760	371	178
MIN	57	37	25	49	50	67	78	773	664	276	119	81
CAL YR	2008	TOTAL	132499	MEAN	362	MAX	2210	MIN	25	AC-FT	262800	
WTR YR	2009	TOTAL	117287	MEAN	321	MAX	1830	MIN	25	AC-FT	232600	

MAX DISCH: 1980 CFS AT 04:00 ON May. 12,2009 GH 5.18 FT. SHIFT 0.01 FT.

MAX GH: 5.18 FT. AT 04:00 ON May. 12,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08246500 CONEJOS RIVER NEAR MOGOTE
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08247500 SAN ANTONIO RIVER AT ORTIZ
Water Year 2009

Location.-- Lat. 36°59'35", Long. 106°02'17", UTM X 407576.8, Y 4094607.5, in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, T.32 N., R.8 E., Rio Arriba County, New Mexico, Hydrologic Unit 13010005, on left bank 800 ft south of Colorado-New Mexico State line, 0.4 mi southeast of Ortiz, and 0.4 mi upstream from Los Pinos River.

Drainage and Period of Record.-- 110 mi². April 1919 to Oct. 1920, Oct. 1924 to current year (no winter record prior to 1941). Monthly data only for some periods.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 with HDR GOES radio) and a float-operated shaft encoder in a 42 inch metal pipe shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway is condemned. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 14, 2008 through Mar. 4, 2009 due to well, oil cylinder, and inlets freezing. The stage-discharge relation was affected by ice Nov. 6 through Dec. 13, 2008, and Mar. 7-9, 11, 12, 14, 15, 23-31, 2009. There was no flow Aug. 22-27, and Sep. 4, 2009 (7 days). Trash and leaves were cleaned from the control on Oct. 15, 2008, resulting in change of gage-height. This correction was considered a change in control and was accounted for through shift distribution. Five instrumentation corrections were made to the shaft encoder during the year ranging from -0.02 to +0.01 feet. The correction of -0.02 feet, made on May 11, 2009, was distributed from point of error as determined by comparison with chart. All others were prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 12, 2009 using B.M. No. 4 as base. The gage was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Control consists of two shifting gravel bars approximately 50 feet and 100 feet below the gage and the channel at higher stages. Rating No. 14, used since January 1, 2004, was used again this year. It is not very well defined. All measurements plotted left of the curve indicating considerable aggradation. Twenty-eight measurements (Nos. 35-62) were made this year, ranging in discharge from 0.18 to 384 cfs. A measurement was attempted on May 1, 2009 using the StreamPro ADCP but due to extremely poor ADCP conditions, it was not considered a measurement. They cover the discharge range experienced except for lower daily flows on Aug. 12, 13, 20-28, Sep. 2-6, 2009. The peak flow of 453 cfs occurred at 06:15 on May 6, 2009 at a gage-height of 4.52 feet with a shift of -0.24 feet. It exceeded high measurement No. 50 (GH=4.22), made May 5, 2009 by 0.30 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Two variable shift curves were used to define the stage-shift relation, thereby redefining the stage-discharge relation. Both shift curves were left open-ended at the top since there was no evidence to indicate shifts trending back toward the rating. Measurements show shifts varied between -0.27 and -0.05 feet. All open water measurements were given full weight and applied except for Nos. 37, 47, 50, 51, 53, 54, 56, and 59, which were adjusted as much as 7% to smooth shift distribution. The two highest measurements, Nos. 50 and 51, were both made on May 5, 2009. One was a standard current meter measurement and the other was an ADCP measurement. Both measurements were adjusted to the same shift near the center of the shift range.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using eight measurements, weather records, partial day records, and comparison with the station 'Los Pinos River near Ortiz'. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height, ice affected record, and extreme low flows, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- A new rating should be created for the 2010 water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08247500 SAN ANTONIO RIVER AT ORTIZ

RATING TABLE--

SANORTCO14 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

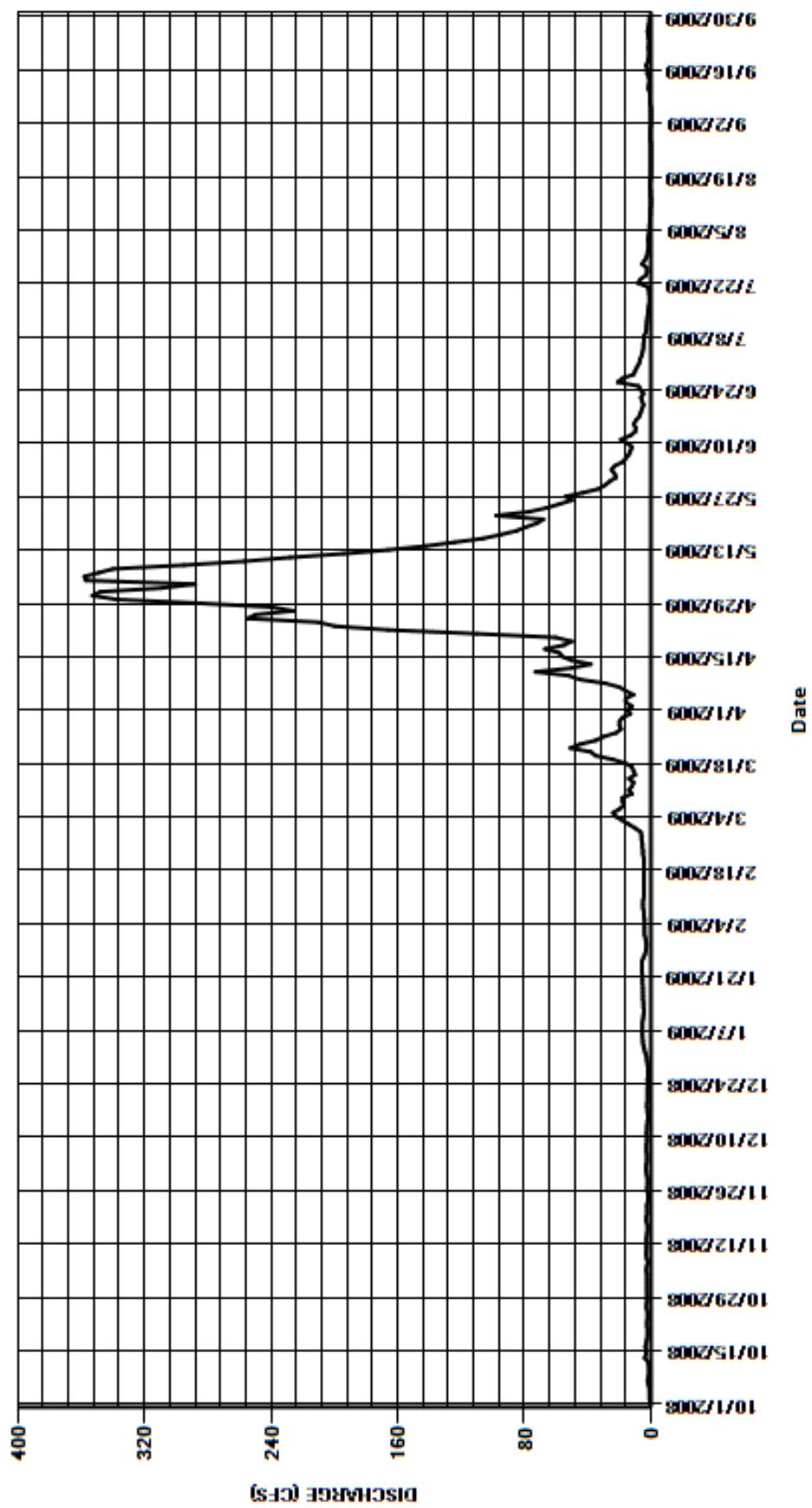
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.75	2.6	3	3.6	4	10	15	353	22	7.4	1.7	0.22
2	0.86	2.6	3.2	4.2	4	14	12	348	23	6.9	1.8	0.06
3	0.86	2.6	2.8	4.8	4	18	16	309	25	5.9	1.8	0.02
4	0.89	2.6	2.6	5.2	4	22	16	288	23	5.3	1.3	0
5	0.95	3	2.6	5.3	4	24	11	357	18	4.8	1	0.04
6	1.6	2.7	2.8	5.5	4.5	20	16	358	16	4.8	0.91	0.11
7	2.2	2	3	5.6	4.5	17	20	349	14	4.3	0.74	0.49
8	1.6	2.6	2.8	5.5	5	18	29	340	13	4.5	0.57	0.85
9	1.4	3.1	2.6	5.4	5	18	45	295	12	3.4	0.45	0.7
10	1.4	3	2.6	5	5	12	52	257	15	2.9	0.39	0.82
11	1.5	2.8	2.8	4.7	4.5	14	73	228	19	2.8	0.21	1.7
12	2	2.8	2.6	4.5	4.5	12	50	194	13	2.6	0.12	1.4
13	4	3	2.5	4.7	4.5	11	38	166	10	2.3	0.06	0.99
14	3.1	2.7	2.2	4.8	4.5	14	50	142	9.6	2	0.28	1.4
15	3.1	2.4	2	5	4.5	10	56	124	11	1.7	0.21	2.4
16	3.6	2.2	2.1	5	4.3	11	58	106	9.5	1.4	0.61	2.2
17	3	2.4	2.3	5.2	4.5	12	67	95	7.4	0.93	0.78	3.2
18	2.5	3	2.6	5.2	4.5	16	55	85	6.5	1	0.36	2.1
19	2.3	3	2.4	5.3	4.5	24	50	79	5.7	1.2	0.22	1.6
20	2.2	2.4	2.2	5.4	4.5	35	60	72	4.7	1.3	0.09	1.3
21	2.4	2.4	2.2	5.5	4.5	38	110	68	5.6	2.1	0.03	1.5
22	2.5	2.6	2.2	5.6	5	51	166	98	6.3	8.2	0	1.6
23	2.4	2.1	2.2	5.6	5	45	200	77	4.7	6.6	0	1.3
24	2.3	1.7	2	5.8	5.5	35	210	66	6.6	3.3	0	1.5
25	2.2	2	2.2	5.8	5.5	30	255	58	7.9	2.4	0	1.9
26	2.8	2.4	2	4.8	6	22	250	50	21	2.6	0	2.2
27	2.8	2.4	1.8	3.7	6	19	226	54	18	5.7	0	1.7
28	2.5	2.3	2	3.2	6.5	20	240	43	11	3.8	0.13	1.3
29	2.4	2.2	2.2	3	---	20	285	33	10	2.6	0.49	1
30	2.4	2.7	2.6	3	---	18	338	29	8.8	2.2	0.39	0.92
31	2.6	---	2.8	3.5	---	13	---	26	---	1.7	0.37	---
TOTAL	67.11	76.3	75.9	149.4	132.8	643	3069	5147	377.3	108.63	15.01	36.52
MEAN	2.16	2.54	2.45	4.82	4.74	20.7	102	166	12.6	3.5	0.48	1.22
AC-FT	133	151	151	296	263	1280	6090	10210	748	215	30	72
MAX	4	3.1	3.2	5.8	6.5	51	338	358	25	8.2	1.8	3.2
MIN	0.75	1.7	1.8	3	4	10	11	26	4.7	0.93	0	0
CAL YR	2008	TOTAL	14404.61	MEAN	39.4	MAX	420	MIN	0.16	AC-FT	28570	
WTR YR	2009	TOTAL	9897.97	MEAN	27.1	MAX	358	MIN	0	AC-FT	19630	

MAX DISCH: 453 CFS AT 06:15 ON May. 06,2009 GH 4.52 FT. SHIFT -0.24 FT.

MAX GH: 4.52 FT. AT 06:15 ON May. 06,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08247500 SAN ANTONIO RIVER AT ORTIZ
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08248000 LOS PINOS RIVER NEAR ORTIZ
Water Year 2009

Location.-- Lat. 36°58'56", Long. 106°04'23", UTM X 404448.5, Y 4093440.2, on line between secs. 26 and 27, T.32 N., R.8 E., Rio Arriba County, New Mexico, Hydrologic Unit 13010005, on left bank 0.9 mi south of Colorado-New Mexico State line, 2.1 mi southwest of Ortiz, and 2.9 mi upstream from mouth.

Drainage and Period of Record.-- 167 mi². Jan. 1, 1915 to Apr. 14, 1955, water stage recorder at location 350' upstream. Apr. 15, 1955 relocated to present site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio) and a shaft encoder in a 42 inch metal pipe shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. The supplemental outside chain gage is inoperable. Cableway located 190 feet above gaging station. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 17, 2008 through Mar. 2, 2009 when the well and oil cylinder were frozen. Stage-discharge relation was affected by ice Nov. 16, 17, 21-26, 29, 30, Dec. 1-16, 2008, and Mar. 3-6, 8, 9, 11-16, 27, 28, 31, 2009. Three instrumentation corrections ranging from -0.02 to +0.01 feet were made to the shaft encoder during the year. All corrections were prorated by time from the previous visit. Hourly chart gage-height averages were used from Apr. 24 to May 1, 2009 due to shaft encoder float tape slipping off pins. The gage-height record is questionable from May 18 to Jun. 1, 2009 due to sluggish inlets causing a time-lag and damped response.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 13, 2009, using BM #5 as base. The RP was within allowable limits, so no correction was made or required. A new benchmark, BM 7, was established. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Control is a gravel and cobble riffle approximately 300 feet below the gage. Rating No. 14.1, was developed and used this year. It is well defined from 14 to 1210 cfs. Twenty-seven measurements (Nos. 583-609) were made this year ranging in discharge from 12.5 to 1110 cfs. They cover the discharge range experienced except for the lower daily flows on Nov. 6, 7, Dec. 27, 2008, Aug. 22, 23, 29, Sep. 8, 2009; and higher daily flows on May 7-13, 2009. The peak flow of 1580 cfs occurred at 02:00 on May 8, 2009 at a gage-height of 6.63 feet with a shift of -0.02 feet. It exceeded high measurement No. 598 (GH=5.76), made May 11, 2009 by 0.87 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Open water measurements show shifts varied between -0.10 and +0.04 ft. All measurements were given full weight and applied except Nos. 584, 597, 600, 602, and 609, which were adjusted as much as 5% to smooth shift distribution. Measurement No. 599 was not used but a check measurement, No. 600, was immediately made and used. These measurements were made during the period of questionable gage-height record due to sluggish inlets and therefore, the shifts are also questionable. The check measurement shift was adjusted to same shift as the high measurement shift, made nine days earlier, before the inlet issue arose.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated on the basis of nine measurements, weather records, partial day records, and comparison with the nearby station "San Antonio River at Ortiz, CO." A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor; and the period of sluggish inlets (May 18 to Jun. 1, 2009), which is fair. Although the daily record for this period is rated fair, the hourly or unit record for this period should be considered poor due to the time-lag and damped highs and lows. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08248000 LOS PINOS RIVER NEAR ORTIZ

RATING TABLE--

LOSORTCO14.1 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

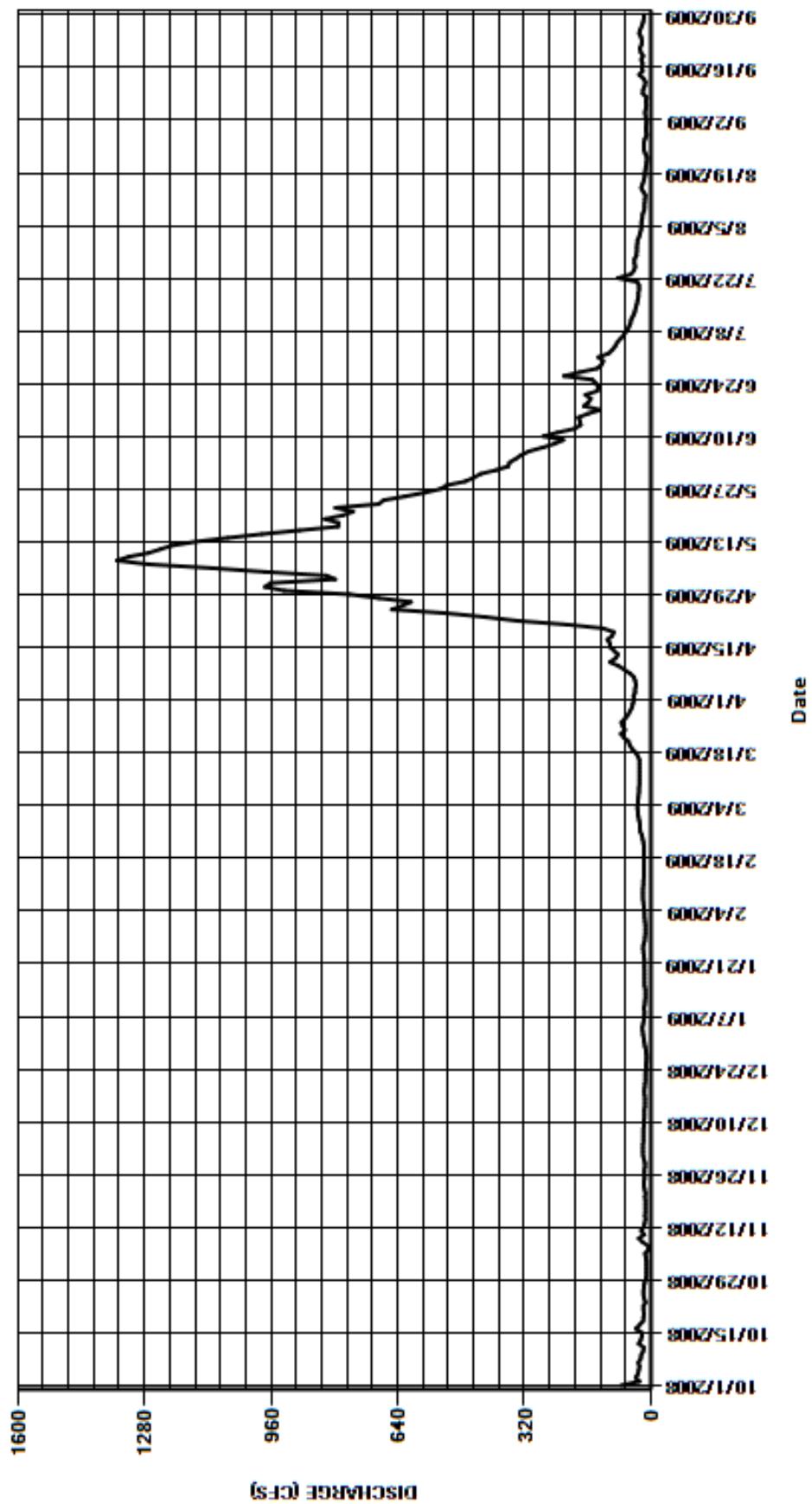
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	75	12	20	18	15	32	43	976	392	133	34	12
2	29	12	20	20	16	33	44	961	361	107	30	12
3	39	12	20	21	16	34	40	798	358	97	27	14
4	33	13	20	22	17	34	40	820	342	90	25	15
5	31	15	19	20	18	33	38	977	328	85	24	13
6	29	5.9	19	18	19	32	40	1110	308	76	24	12
7	32	7.3	19	17	20	31	43	1270	274	68	22	13
8	26	21	19	16	20	30	53	1350	244	61	21	11
9	25	31	18	18	20	30	67	1320	222	56	17	21
10	20	17	18	16	20	29	82	1270	272	52	16	20
11	18	25	17	15	19	29	104	1240	236	50	16	16
12	31	18	17	14	19	29	90	1210	193	45	15	14
13	26	16	17	14	18	29	83	1150	178	41	14	19
14	23	14	15	14	18	29	93	1070	180	39	20	30
15	24	15	15	16	18	29	103	983	183	36	25	21
16	38	14	15	16	18	29	104	888	159	34	21	23
17	29	14	16	16	18	33	110	791	128	32	18	21
18	20	14	17	16	18	39	98	790	170	32	16	25
19	19	14	16	16	18	48	94	824	158	30	15	20
20	18	15	15	17	18	54	122	779	152	30	14	26
21	19	14	14	17	18	57	213	753	166	35	12	28
22	19	16	14	17	19	69	338	798	136	84	11	24
23	14	18	14	18	21	76	419	688	133	51	10	23
24	17	18	12	19	23	66	516	676	139	43	14	25
25	19	16	13	20	27	71	655	623	148	40	18	30
26	19	17	12	19	28	75	628	573	220	42	18	27
27	18	17	11	16	28	66	607	532	180	42	18	23
28	17	15	12	15	30	58	688	516	136	37	15	20
29	13	15	13	14	---	53	761	470	125	36	11	18
30	12	18	15	14	---	48	927	448	121	36	13	18
31	12	---	17	14	---	46	---	431	---	35	13	---
TOTAL	764	469.2	499	523	557	1351	7243	27085	6342	1675	567	594
MEAN	24.6	15.6	16.1	16.9	19.9	43.6	241	874	211	54	18.3	19.8
AC-FT	1520	931	990	1040	1100	2680	14370	53720	12580	3320	1120	1180
MAX	75	31	20	22	30	76	927	1350	392	133	34	30
MIN	12	5.9	11	14	15	29	38	431	121	30	10	11
CAL YR	2008	TOTAL	58256.2	MEAN	159	MAX	1380	MIN	5.9	AC-FT	115600	
WTR YR	2009	TOTAL	47669.2	MEAN	131	MAX	1350	MIN	5.9	AC-FT	94550	

MAX DISCH: 1580 CFS AT 02:00 ON May. 08,2009 GH 6.63 FT. SHIFT -0.02 FT.

MAX GH: 6.63 FT. AT 02:00 ON May. 08,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08248000 LOS PINOS RIVER NEAR ORTIZ
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08248500 SAN ANTONIO RIVER NEAR MANASSA
Water Year 2009

Location.-- Lat. 37°10'38", Long. 105°52'35", UTM X 422052.9, Y 4114863.9, in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, T.34 N., R.10 E., Conejos County, Hydrologic Unit 13010005, on right bank 0.3 mi. downstream from bridge on State Highway 142, 2.2 mi. upstream from mouth, and 3.3 mi. east of Manassa, Co.

Drainage and Period of Record.-- 348 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 10, 2008 through March 5, 2009 when the station was closed for the winter. There was a beaver dam on the control Nov. 7-19, 2008. The stage-discharge relation was affected by ice Dec. 7-9, 2008, Mar. 27, 2009. There was no flow Oct. 1-16, 2008 and Aug. 2 - Sep. 30, 2009. There was no flow for 76 days.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage Aug. 12, 2009 using BM #4 as base. The RP was within allowable limits, so no correction was made. A two-peg test was performed on the Lietz level (SN 130869) on July 17, 2009. The test showed instrument was within tolerance, so no adjustment was made.

Rating.-- Control is a gravel riffle approximately 150 ft. below gage. Rating No. 19B in use since June 6, 2005, was used again for this water year. The rating is fairly well defined from 100 to 1600 cfs. It is not very well defined below 100 cfs due to continuous aggradation and degradation. Eighteen measurements (Nos. 271-288) were made this year, ranging in discharge from 0 to 1080 cfs. They cover the discharge range experienced except for the higher daily flows on May 7-13, 2009. The peak flow of 1400 cfs occurred at 20:45 on May 8, 2009 at a gage-height of 6.55 feet with a shift of 0.06 feet. It exceeded high measurement No. 280 (GH=6.18), made on May 5, 2009 by 0.37 ft. in stage.

Discharge.-- Shifting control method was used during all open water periods. Two shift curves, SANMANVS01, used from Mar. 5 through May 5, 2009, and SANMANVS02 used from May 5 to Aug. 5, 2009 to apply shifts according to stage. SANMANVS01 was used coming out of ice and into the high water period. The gravel bar that acts as the control during lower flows changed during high water and as a result SANMANVS02 was used after the high water period. This year's measurements show shifts varied between -0.13 and +0.12 ft. All were given full weight except Nos. 281 and 284 which were adjusted by as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five measurements, weather records, partial day records, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height, ice affected record, and beaver dams on control, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08248500 SAN ANTONIO RIVER NEAR MANASSA

RATING TABLE--

SANMANCO19B USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

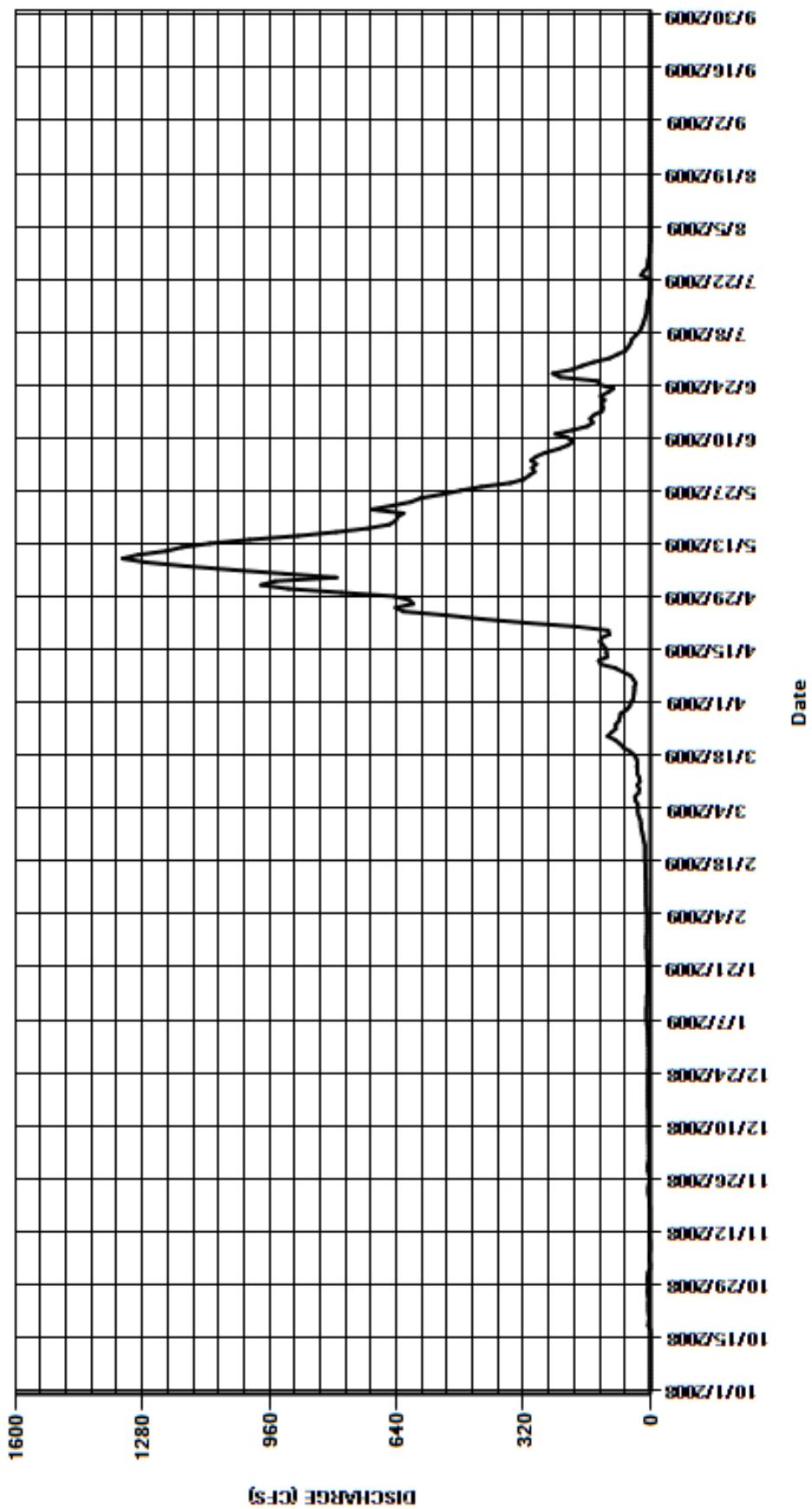
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	6	4	6	9.5	26	49	912	292	104	0.34	0
2	0	1.3	4.4	6	9.5	30	43	981	298	84	0	0
3	0	0.7	4.4	7	9.5	32	42	946	288	63	0	0
4	0	2.4	4.4	7	9.5	32	41	791	301	56	0	0
5	0	3.2	4.5	8	10	32	41	922	288	50	0	0
6	0	3.2	4.6	9	11	38	37	1050	266	47	0	0
7	0	1.1	5	10	11	39	43	1170	232	38	0	0
8	0	0.88	5	10	11	30	50	1270	208	28	0	0
9	0	1.3	5	10	11	28	69	1330	195	23	0	0
10	0	2.2	5	10	12	33	88	1290	208	19	0	0
11	0	2.7	5	9	12	27	125	1220	239	16	0	0
12	0	2.1	5.5	9	12	28	130	1180	197	13	0	0
13	0	1.8	5.5	9	12	33	109	1110	159	10	0	0
14	0	1.7	5.5	8	13	33	111	1010	145	9.3	0	0
15	0	1.7	6.5	8	13	34	111	888	152	8.7	0	0
16	0	2.1	6.5	8	13	33	119	792	143	7	0	0
17	1.2	1.8	6.5	8	13	35	127	712	122	3	0	0
18	5.2	1.7	6.5	8	14	41	124	658	119	1.4	0	0
19	4	2.5	6.5	8	14	52	103	642	123	0.86	0	0
20	3.2	2.5	6.5	8	14	68	107	638	116	0.61	0	0
21	4.4	3.6	6	8	14	77	187	622	126	0.49	0	0
22	5.1	5.2	6	8	14	89	313	704	107	0.64	0	0
23	5.4	6	6	9	16	108	424	651	93	24	0	0
24	5.4	4.7	6	9	18	98	514	603	127	17	0	0
25	4.3	3.2	6	9	20	87	623	579	134	7.5	0	0
26	6.2	2.7	5.5	10	22	88	642	525	228	6.6	0	0
27	7.7	3.7	5.5	10	24	80	598	479	246	5.3	0	0
28	6.4	6.7	5.5	10	24	77	607	426	198	3.3	0	0
29	7	7.3	5.5	10	---	75	645	353	173	1.9	0	0
30	7.4	5.8	5.5	9.5	---	60	779	319	143	1.5	0	0
31	7.3	---	6	9.5	---	52	---	306	---	1.2	0	---
TOTAL	80.20	91.78	170.3	268.0	386.0	1595	7001	25079	5666	651.30	0.34	0.00
MEAN	2.59	3.06	5.49	8.65	13.8	51.5	233	809	189	21	0.011	0
AC-FT	159	182	338	532	766	3160	13890	49740	11240	1290	0.7	0
MAX	7.7	7.3	6.5	10	24	108	779	1330	301	104	0.34	0
MIN	0	0.7	4	6	9.5	26	37	306	93	0.49	0	0
CAL YR	2008	TOTAL	54206.89	MEAN	148	MAX	1250	MIN	0	AC-FT	107500	
WTR YR	2009	TOTAL	40988.92	MEAN	112	MAX	1330	MIN	0	AC-FT	81300	

MAX DISCH: 1400 CFS AT 20:45 ON May.08,2009 GH 6.55 FT. SHIFT 0.06 FT.

MAX GH: 6.55 FT. AT 20:45 ON May.08,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08248500 SAN ANTONIO RIVER NEAR MANASSA
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
Water Year 2009

Location.-- Lat. $37^{\circ}18'01''$, Long. $105^{\circ}44'47''$, UTM X 433750.8, Y 4128508.4, in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T. 35 N., R. 11 E., Conejos County, on left bank of main channel 125 ft downstream from bridge on State Route 158, 1.0 mi upstream from mouth, 2.1 mi north of LaSauses, and 13 mi southeast of Alamosa.

Drainage and Period of Record.-- 887 mi 2 . Water stage recorder since March 29, 1921 at five sites close to present location.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio) and a float-operated shaft encoder and air temperature sensor in a four foot square timber shelter and well. The primary reference gage is a drop tape from reference point on shelf. The cableway is located 100 feet below gaging station. The supplementary outside chain gage is no longer operational. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Jan. 2, 2009 when floats were affected by slush ice in well. The stage-discharge relation was affected by ice Dec. 9-12, 14-16, 19-31, 2008, and Jan. 1, 3-8, 27-30, 2009. There were three small flush corrections from Mar. 2 to Apr. 1, 2009 due to the location of inlets causing siphoning/circulating. They were distributed by time using gage-height trend. The upper inlet was extended on Apr. 3 to resolve this problem. One +0.01 foot instrumentation correction was made to the shaft encoder on Jun. 1, 2009, and was prorated by time from the previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on July 28, 2009 using B.M. No. 3 as base. The RP was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- Control is a gravel bar approximately 150 ft. below the gage at medium and low flows, and the channel at high flows. At low flows the water splits into two channels at the control section. The bank, willows, and high water in the Rio Grande influence gage height during very high flows. Rating No. 15, in use since Jan. 3, 2006, was used again this year. Considering the variability of control section, the rating is fairly well defined from 0 to 1730 cfs. Twenty-seven measurements (Nos. 215-241) were made this year ranging in discharge from 0 to 1410 cfs. They cover the discharge range experienced this year. The peak flow of 1420 cfs occurred at 12:00 on May 10, 2009 at a gage-height of 6.44 feet with a shift of -0.15 feet. It exceeded high measurement No. 230 (GH = 6.43), made May 11, 2009, by 0.01 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Three different shift curves were used throughout the year to define the stage-shift relationship. Shift curve VS0901 was used from Oct. 1 to Nov. 3, 2008. Shift curve VS0902 was used from Jan. 15 to Mar. 16, 2009. Due to a change in inlet hydraulics on Mar. 16, 2009, shift curve VS0903 was used from that point to Sep. 2, 2009, when flow ceased for the remainder of water year. These curves were left open-ended since there was no evidence of trending toward the rating within the flow ranges encountered. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts varied from -0.15 to +0.19 feet. All measurements were given full weight and applied except Nos. 223, 225, 228, 231-233, and 235, which were adjusted as much as 5% to smooth shift distribution. Measurement No. 239 (1.16 cfs) was adjusted by 0.01 feet and resulted in a 13% difference. Measurement No. 234 was not used due to moss creating poor measurement conditions.

Special Computations.-- Discharge during periods of no gage-height and ice affected record was estimated using two measurements, weather records, partial record days, and comparison with the South Channel Conejos River near LaSauses gage. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES

RATING TABLE--

NORLASCO15 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.8	17	53	61	71	106	171	977	270	408	17	0.11
2	0.99	17	58	68	71	111	175	1010	266	312	14	0.01
3	2.6	16	62	70	71	115	150	1060	249	231	12	0
4	0.34	15	62	70	71	123	159	905	309	158	19	0
5	0.93	15	52	72	72	129	156	851	488	137	19	0
6	0.61	15	51	70	74	130	144	990	587	121	15	0
7	0.07	15	53	70	79	133	142	1090	602	97	6.6	0
8	0.51	16	65	72	85	121	156	1230	488	62	4.8	0
9	1	16	60	74	82	105	198	1350	347	36	3.6	0
10	0.68	17	55	76	87	113	243	1400	245	12	4	0
11	0.3	17	50	73	77	110	266	1400	272	7.7	4.6	0
12	0.35	18	45	75	73	100	342	1320	219	6.1	2.2	0
13	14	18	59	73	77	110	304	1250	174	17	1.6	0
14	31	20	60	72	75	117	275	1210	164	20	3.5	0
15	31	30	55	70	76	111	257	1130	196	23	4.1	0
16	21	37	50	71	75	116	256	1070	209	19	2.7	0
17	14	40	52	69	78	120	232	974	207	20	2.7	0
18	12	41	54	68	76	134	230	859	195	26	6.9	0
19	12	41	52	70	73	163	184	831	198	31	7.4	0
20	12	43	52	69	72	202	169	891	186	24	7.9	0
21	14	46	50	67	72	250	195	809	200	18	7.6	0
22	17	49	50	70	75	286	347	961	198	18	7.4	0
23	15	49	46	72	86	324	537	992	196	48	7.2	0
24	11	45	46	75	95	332	665	866	220	41	7.5	0
25	12	41	48	81	99	267	806	845	264	31	9	0
26	12	41	48	83	110	254	958	773	492	27	9.4	0
27	14	51	45	84	109	238	876	692	828	25	7.9	0
28	16	59	47	83	106	228	786	556	889	27	7.9	0
29	18	58	50	78	---	212	795	411	813	25	5.9	0
30	18	54	52	72	---	198	859	309	644	21	0.93	0
31	17	---	52	71	---	178	---	282	---	25	0.34	---
TOTAL	325.18	957	1634	2249	2267	5236	11033	29294	10615	2073.8	229.67	0.12
MEAN	10.5	31.9	52.7	72.5	81	169	368	945	354	66.9	7.41	0.004
AC-FT	645	1900	3240	4460	4500	10390	21880	58100	21050	4110	456	0.2
MAX	31	59	65	84	110	332	958	1400	889	408	19	0.11
MIN	0.07	15	45	61	71	100	142	282	164	6.1	0.34	0

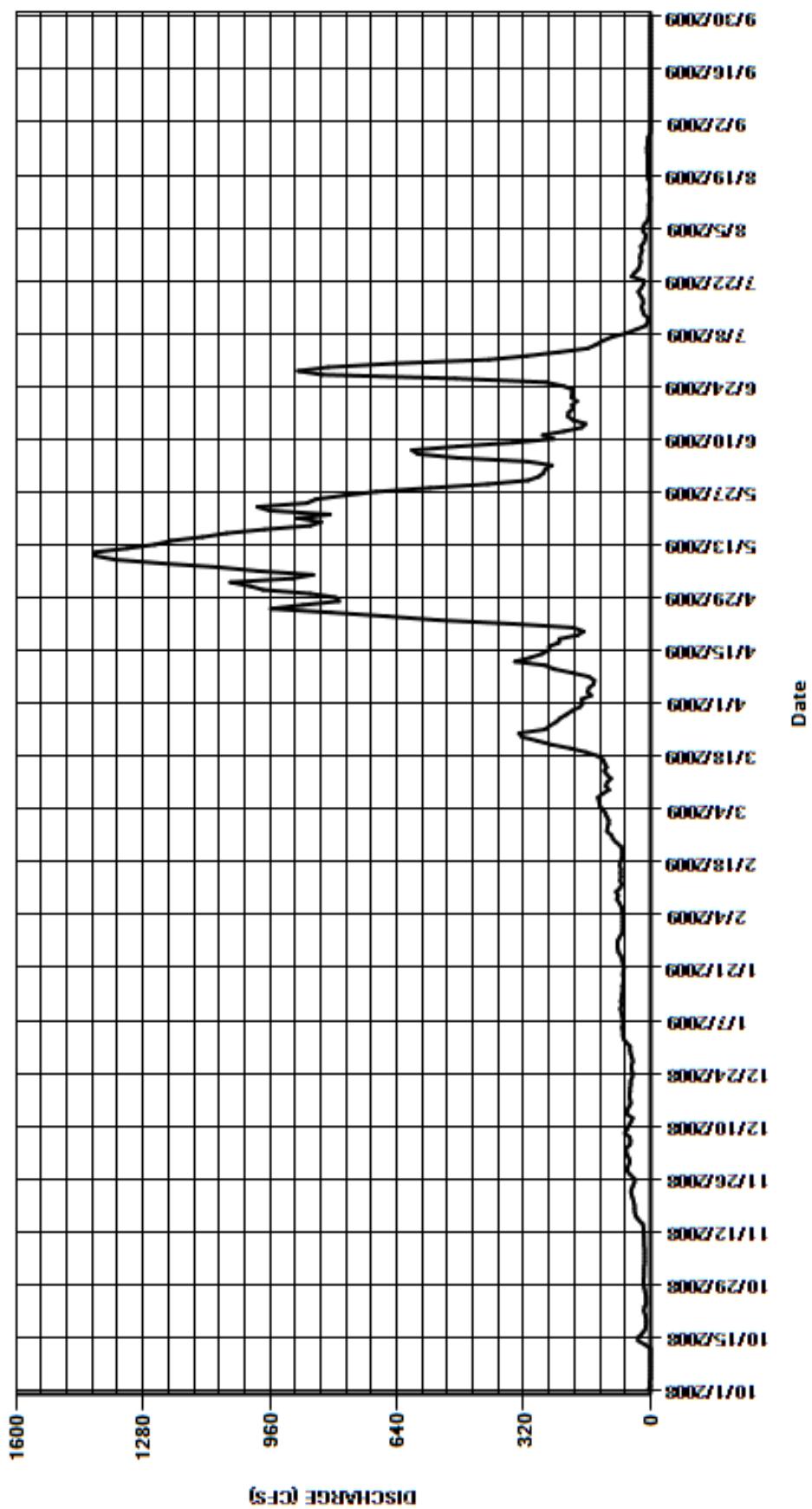
CAL YR	2008	TOTAL	85364.81	MEAN	233	MAX	1320	MIN	0.07	AC-FT	169300
WTR YR	2009	TOTAL	65913.77	MEAN	181	MAX	1400	MIN	0	AC-FT	130700

MAX DISCH: 1420 CFS AT 12:00 ON May. 10,2009 GH 6.44 FT. SHIFT -0.15 FT.

MAX GH: 6.44 FT. AT 12:00 ON May. 10,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
Water Year 2009

Location.-- Lat. 37°18'01", Long. 105°44'47", UTM X 433744.8, Y 4127737.3, in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, T. 35 N., R. 11 E., Conejos County, on left bank of secondary channel 230 ft upstream from bridge on State Route 158, 1.0 mi upstream from mouth, 1.5 mi north of LaSauses, and 13 mi southeast of Alamosa.

Drainage and Period of Record.-- 887 mi². Water stage recorder since March 29, 1921 at various sites close to present location.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink DCP with HDR GOES radio) and a float-operated shaft encoder in a 42 inch metal pipe shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this water year.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 10-14, 2008 when floats were affected by ice in well; and Dec. 15, 1008 to Mar. 2, 2009 when the station was closed for winter. The stage-discharge relation was affected by ice Dec. 9, 2008. There was no flow Oct. 1-18, 2008, and Jul. 28 through Sep. 30, 2009 (83 days). There were no instrumentation corrections made to the shaft encoder during the year. There were large trash corrections on Apr. 15 and May 1, 2009 due to cleaning trash off the control. These corrections were distributed by time with trend comparison with North Channel Conejos River near La Sauses.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 17, 2009 using B.M. No. 7 as base. The gage was outside allowable limits, so a correction of +0.03 feet was made to the RP. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009. In comparing shifts, it was assumed that the gage settled during the period of May 8-9, 2009, due to ground thaw and saturation. A datum correction of -0.03 feet was applied to gage-heights from May 8 to Aug. 17, 2009.

Rating.-- The control is a steel sheet piling weir with a low flow notch. Rating No. 9 in use from Mar. 21, 2008 was used again this year. It is well defined from 0 to 379 cfs. Twenty-six measurements (Nos. 378-403) were made this year ranging in discharge from 0 to 166 cfs. They cover the daily discharge range experienced this year. The peak flow of 173 cfs occurred at 11:30 on May 10, 2009 at a gage-height of 3.16 feet (Datum corr. -0.03 ft applied) with a shift of -0.02 feet. It exceeded high measurement No. 393 (GH = 3.13), made May 11, 2009, by 0.03 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. A variable shift curve (SOULASVS0901) was used to define the stage-shift relation from May 11 to Sep. 30, 2009. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Shifts were distributed by time and change in stage from May 1 to 11, 2009. Open water measurements show shifts varied between -0.02 and +0.04 ft. All measurements were given full weight except Nos. 389, 391, 394, 398, and 399, which were adjusted as much as 8 percent to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using six measurements, weather records, partial record days, and comparison with the North Channel of the Conejos River near LaSauses. A hydrograph was used.

Remarks.-- Record is good, except for periods of no gage-height and ice affected record, and the period from Apr. 1 to May 1, 2009 due to uncertainty in distribution of trash corrections, which should be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES

RATING TABLE--

SOULASCO09 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0.55	1.6	1.8	4.5	0.72	7.1	2.3	7.7	0	0
2	0	0	0.66	1.7	1.8	4.9	0.66	9.4	2.4	4.2	0	0
3	0	0	0.78	1.8	1.8	5.2	0.69	12	2.6	3.8	0	0
4	0	0	0.94	1.7	1.8	5.6	0.63	6.7	3.2	4	0	0
5	0	0	0.65	1.6	2	6	0.62	5.7	5.6	4.1	0	0
6	0	0	0.56	1.6	2.2	5.8	0.58	11	6.4	4.6	0	0
7	0	0	0.59	1.6	2.4	6	0.62	23	6.8	4.6	0	0
8	0	0	0.95	1.6	2.4	5.4	0.61	43	5.9	3.7	0	0
9	0	0	1.1	1.6	2.2	4.4	0.84	116	5.1	2.8	0	0
10	0	0	0.9	1.6	2	4.8	1.2	161	6	1.4	0	0
11	0	0	0.5	1.6	2	4.8	1.4	147	6.6	0.79	0	0
12	0	0	0.5	1.6	2	3.9	2.1	91	6.1	0.54	0	0
13	0	0	0.8	1.6	2	4.1	1.6	57	5.4	0.52	0	0
14	0	0	1.1	1.6	2.2	4.5	1.2	48	5.2	0.39	0	0
15	0	0	1.2	1.7	2.2	4.2	2.2	32	5.3	0.32	0	0
16	0	0	1.3	1.6	2.2	4.2	1.3	24	5.2	0.25	0	0
17	0	0	1.3	1.6	2.6	4.3	1.3	14	5.3	0.21	0	0
18	0	0	1.5	1.6	2.4	4.9	1.3	7.9	5	0.16	0	0
19	0	0.2	1.5	1.7	2.2	5.1	1.1	7	5	0.11	0	0
20	0	0.34	1.5	1.7	2.2	6	0.95	8.8	4.7	0.09	0	0
21	0	0.4	1.4	1.7	2.2	7	0.98	7.3	4.5	0.07	0	0
22	0	0.47	1.3	1.8	2.4	7.5	2.8	13	4.2	0.1	0	0
23	0	0.51	1.2	1.8	3	3.3	4.3	16	4	0.07	0	0
24	0	0.44	1.2	2	3.6	3.9	5.2	8.1	4.1	0.06	0	0
25	0	0.38	1.3	2.2	4.4	2.8	5.7	7.1	5.1	0.03	0	0
26	0	0.37	1.3	2.1	4.4	2.2	7.4	5.6	8	0.02	0	0
27	0	0.44	1.2	2	4.2	1.9	5.6	4.8	21	0.01	0	0
28	0	0.77	1.1	1.9	4.2	1.7	3.7	3.8	33	0	0	0
29	0	0.91	1.2	1.8	---	1.5	3.2	3.3	20	0	0	0
30	0	0.84	1.4	1.8	---	1.3	4	2.9	16	0	0	0
31	0	---	1.5	1.8	---	0.93	---	2.6	---	0	0	---
TOTAL	0.00	6.07	32.98	53.6	70.8	132.63	64.50	906.1	220.0	44.64	0.00	0.00
MEAN	0	0.2	1.06	1.73	2.53	4.28	2.15	29.2	7.33	1.44	0	0
AC-FT	0	12	65	106	140	263	128	1800	436	89	0	0
MAX	0	0.91	1.5	2.2	4.4	7.5	7.4	161	33	7.7	0	0
MIN	0	0	0.5	1.6	1.8	0.93	0.58	2.6	2.3	0	0	0

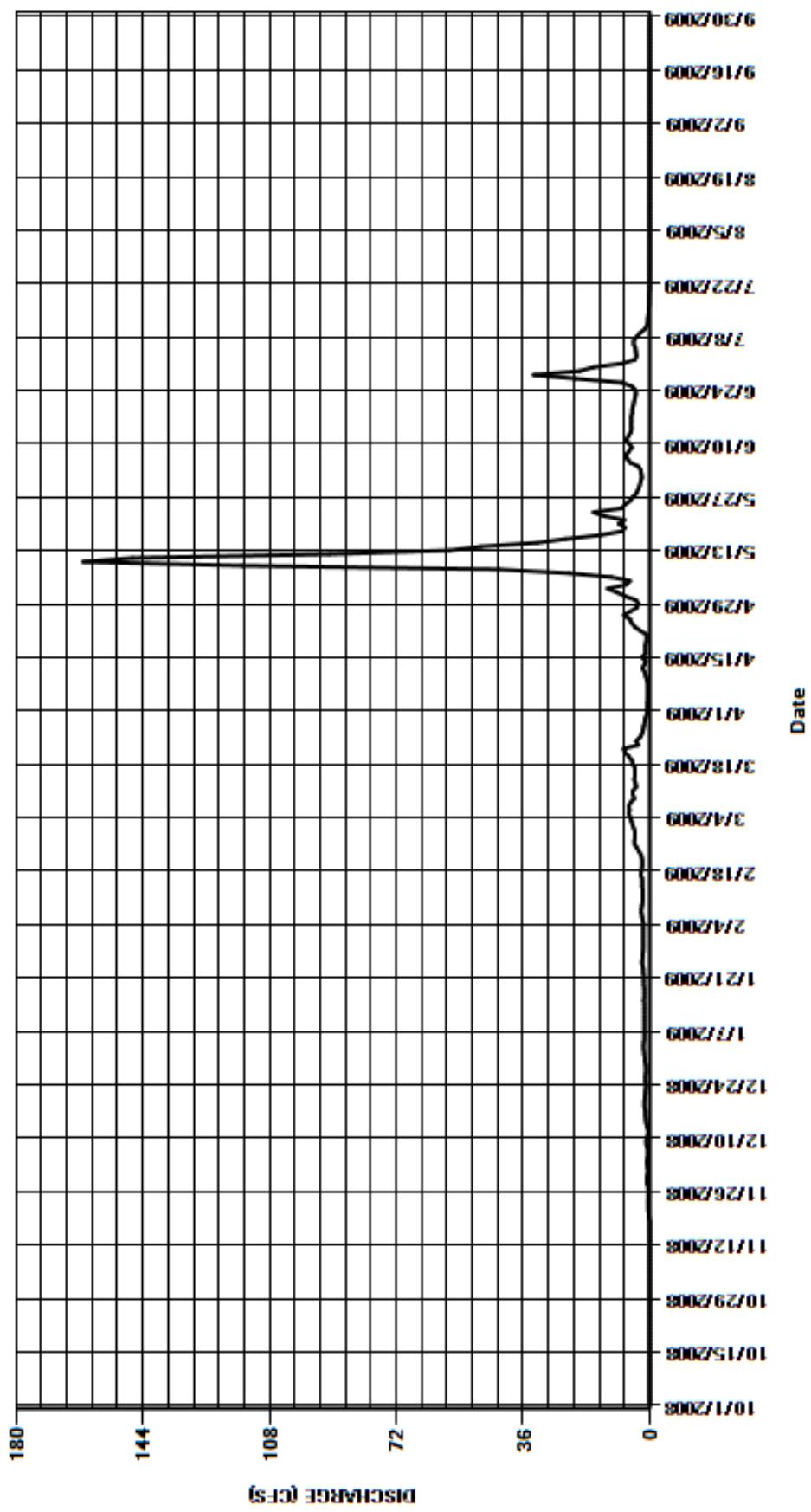
CAL YR	2008	TOTAL	3836.74	MEAN	10.5	MAX	369	MIN	0	AC-FT	7610
WTR YR	2009	TOTAL	1531.32	MEAN	4.2	MAX	161	MIN	0	AC-FT	3040

MAX DISCH: 173 CFS AT 11:30 ON May. 10,2009 GH 3.16 FT. SHIFT -0.02 FT. (RP CORR. -0.03 FT. APPLIED)

MAX GH: 3.16 FT. AT 11:30 ON May. 10,2009 (RP CORR. -0.03 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)
Water Year 2009

Location.-- Lat 37°18'01", long 105°44'47", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, and SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10 (two channels), T.35 N., R.II E., Conejos County, Hydrologic Unit 13010005, on left bank of main channel 125 ft downstream from bridge on State Highway 158 and on left bank of secondary channel 230 ft upstream from bridge on State Route 158, 1.0 mi upstream from mouth, 2.1 mi north of Lasause, and 13 mi southeast of Alamosa.

Drainage and Period of Record.-- 887 mi². Mar. 1921, water stage recorders, at several locations close to present sites.

Equipment.-- Combined record is from Main (north) channel and Secondary (south) channel. See individual records for gage equipment descriptions.

Hydrographic Conditions.--

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- Daily discharges computed by summing and rounding the individual station daily discharges. A day is considered estimated if the estimated portion of a daily sum is greater than 5% of the daily sum. The following days were considered estimated: Dec. 9-12, 14-16, 19-31, 2008; Jan. 1-8, 27-30, 2009.

Special Computations.--

Remarks.-- Record is good, except for periods of estimated record, which are poor. The record for period Apr. 1 - May 1, 2009 was considered poor at the South Channel, but the combined record for this period is considered good since all South Channel daily discharges during this period were less than 1% of the combined daily discharges. Record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

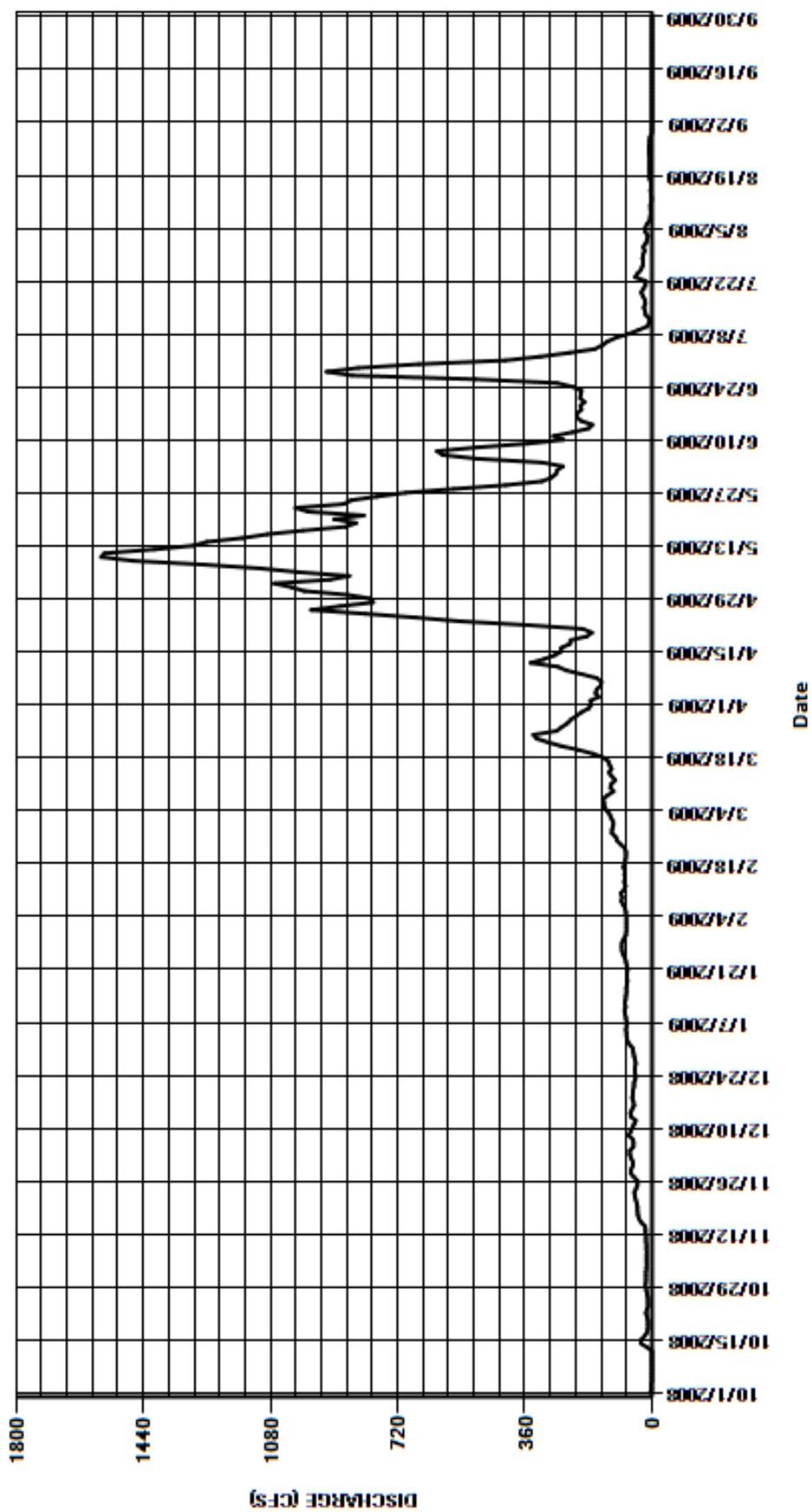
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.8	17	54	63	73	110	172	984	272	416	17	0.11
2	0.99	17	59	70	73	116	175	1020	268	316	14	0.01
3	2.6	16	63	72	73	120	151	1070	252	235	12	0
4	0.34	15	63	72	73	129	160	912	312	162	19	0
5	0.93	15	53	74	74	135	157	857	494	141	19	0
6	0.61	15	52	72	76	136	145	1000	593	126	15	0
7	0.07	15	54	72	81	139	143	1110	609	102	6.6	0
8	0.51	16	66	74	87	126	157	1270	494	66	4.8	0
9	1	16	61	76	84	109	199	1470	351	39	3.6	0
10	0.68	17	56	78	89	118	243	1560	251	13	4	0
11	0.3	17	51	75	79	115	267	1550	279	8.5	4.6	0
12	0.35	18	46	77	75	104	344	1410	225	6.6	2.2	0
13	14	18	60	75	79	114	306	1300	179	18	1.6	0
14	31	20	61	74	77	122	276	1260	169	20	3.5	0
15	31	30	56	72	78	115	258	1160	201	23	4.1	0
16	21	37	51	73	77	120	257	1090	214	19	2.7	0
17	14	40	53	71	81	124	233	988	212	20	2.7	0
18	12	41	56	70	78	139	231	867	200	26	6.9	0
19	12	41	54	72	75	168	185	838	203	31	7.4	0
20	12	43	54	71	74	208	170	900	191	24	7.9	0
21	14	46	51	69	74	257	196	816	204	18	7.6	0
22	17	49	51	72	77	294	350	974	202	18	7.4	0
23	15	50	47	74	89	327	541	1010	200	48	7.2	0
24	11	45	47	77	99	336	670	874	224	41	7.5	0
25	12	41	49	83	103	270	812	852	269	31	9	0
26	12	41	49	85	114	256	965	778	500	27	9.4	0
27	14	51	46	86	113	240	882	697	849	25	7.9	0
28	16	60	48	85	110	230	790	560	922	27	7.8	0
29	18	59	51	80	---	214	798	414	832	25	5.9	0
30	18	55	53	74	---	199	863	312	660	21	0.93	0
31	17	---	54	73	---	179	---	285	---	25	0.34	---
TOTAL	325.18	961	1669	2311	2335	5369	11096	30188	10831	2118.1	229.57	0.12
MEAN	10.5	32	53.8	74.5	83.4	173	370	974	361	68.3	7.41	0.004
AC-FT	645	1910	3310	4580	4630	10650	22010	59880	21480	4200	455	0.2
MAX	31	60	66	86	114	336	965	1560	922	416	19	0.11
MIN	0.07	15	46	63	73	104	143	285	169	6.6	0.34	0

CAL YR	2008	TOTAL	89222.81	MEAN	244	MAX	1690	MIN	0.07	AC-FT	177000
WTR YR	2009	TOTAL	67432.97	MEAN	185	MAX	1560	MIN	0	AC-FT	133800

MAX DISCH: N/A--see records for individual gages
MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08250000 CULEBRA CREEK AT SAN LUIS
Water Year 2009

Location.-- Lat. 37°11'01", Long. 105°25'31", UTM X 462202.3, Y 4115356.8, Costilla County, Hydrologic Unit 13010002, in Beaubien Grant, on left bank at bridge 1.0 mi. south of San Luis and 1.0 mi. upstream from Rito Seco.

Drainage and Period of Record.-- 220 mi². Station established April 1, 1927 by Colo. State Engineer's Office at present site, different datum. May 1931 new flume installed and datum established at the same site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a metal shelter and rock well. The primary reference gage is a drop tape from reference point on shelf. Outside staff gage. No change.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable for the water year. There were no instrumentation corrections made to the shaft encoder during the year.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 16, 2008 to the Reference Point (RP) inside the gage using BM #3 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control is a non-standard 12-ft. concrete Parshall flume. Gravel and moss in flume, changes in approach velocity, and debris cause shifting. Rating No. 6 was used again this year. It is well defined from 9 to 380 cfs. Fifteen measurements (Nos. 215-229) were made this year ranging in discharge from 19.9 to 112 cfs. Measurements cover the range experienced except for the lower daily flows on Apr. 29 and 30, 2009; and the higher daily flows on May 15, 16, and Jul. 1, 2, 2009. The peak flow of 135 cfs occurred at 10:15 on July 2, 2009 at a gage height of 1.70 feet with a shift of 0.00 feet and exceeded high measurement No. 223 (GH=1.46 ft.) made May 14, 2009 by 0.24 ft. in stage.

Discharge.-- Shifting control method was used for all periods. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied between -0.05 and +0.04 ft. All were given full weight except Nos. 215, 217, 221, and 223-227, which were adjusted as much as 5% to smooth shift distribution. Since the two highest measurements were within 0.05 feet in gage-height and within 5% of the rating, one with positive shift and the other with negative shift, it seemed justified to adjust both measurements to the rating.

Special Computations.--

Remarks.-- Record is good. During the winter the record may show a pattern of jagged peaks in the late morning hours. While this pattern does appear to be ice affected record, it has been verified by the hydrographic staff of Division 3 that this is caused by ice dams releasing water above the gage, and that this is good record. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08250000 CULEBRA CREEK AT SAN LUIS

RATING TABLE--

CULSANCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	34	30	20	24	21	21	24	90	114	68	68
2	32	33	29	21	24	22	20	25	89	122	59	60
3	32	33	30	21	24	22	21	24	74	88	75	53
4	32	33	27	21	25	22	21	44	51	76	89	54
5	34	33	27	21	25	21	21	46	63	74	106	55
6	33	29	27	21	26	23	20	44	90	91	104	54
7	31	27	29	21	27	23	20	56	101	102	82	54
8	31	31	31	21	29	22	20	77	86	98	80	53
9	30	33	25	21	25	23	20	79	69	97	81	53
10	29	35	24	21	26	22	20	79	53	95	92	43
11	46	34	24	20	26	21	22	71	43	84	105	31
12	52	33	24	21	25	22	24	64	47	62	94	32
13	39	33	27	20	24	23	31	65	41	65	81	36
14	43	31	23	20	23	22	33	88	44	100	88	29
15	43	28	23	20	23	21	26	115	60	111	32	28
16	38	29	24	20	24	21	24	115	74	107	22	27
17	36	30	24	21	24	21	25	99	85	105	34	30
18	36	30	24	20	24	21	28	94	88	98	60	29
19	36	30	22	20	23	21	30	89	74	87	71	28
20	36	29	20	21	22	21	26	93	74	86	59	33
21	36	29	21	21	22	21	23	104	82	86	48	40
22	35	28	21	21	23	20	22	69	75	86	47	35
23	33	29	21	26	26	20	20	33	74	86	46	35
24	36	28	20	34	28	20	21	45	83	87	61	34
25	35	25	21	35	25	20	24	73	88	87	73	32
26	35	27	20	30	23	21	24	86	82	87	72	31
27	35	31	20	26	21	20	22	68	63	89	62	29
28	34	32	20	23	20	22	20	43	61	100	60	27
29	33	30	21	23	---	22	19	65	64	109	68	26
30	33	29	21	24	---	21	19	85	88	93	68	27
31	33	---	21	25	---	20	---	87	---	76	69	---
TOTAL	1098	916	741	700	681	662	687	2149	2156	2848	2156	1166
MEAN	35.4	30.5	23.9	22.6	24.3	21.4	22.9	69.3	71.9	91.9	69.5	38.9
AC-FT	2180	1820	1470	1390	1350	1310	1360	4260	4280	5650	4280	2310
MAX	52	35	31	35	29	23	33	115	101	122	106	68
MIN	29	25	20	20	20	20	19	24	41	62	22	26

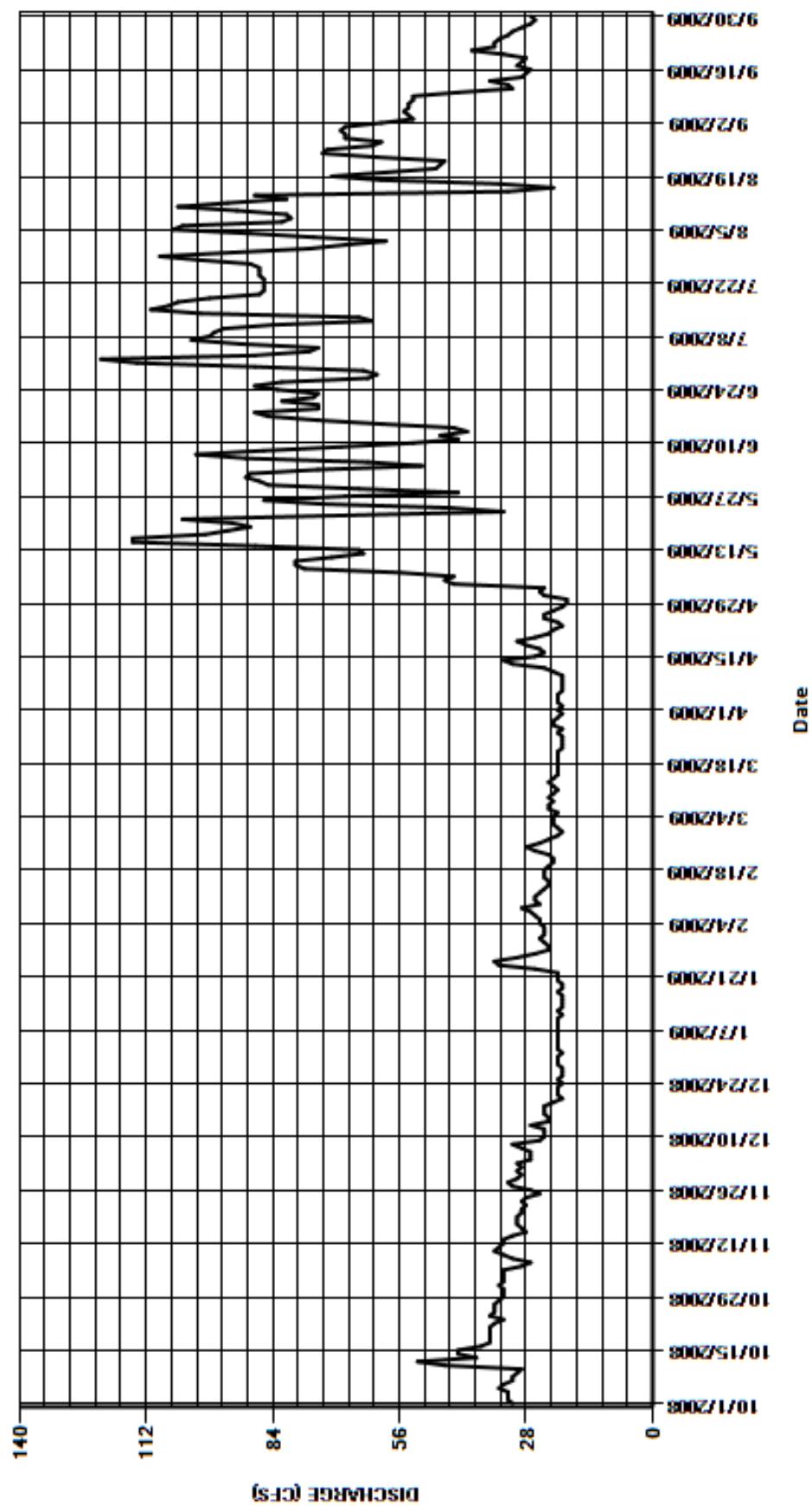
CAL YR	2008	TOTAL	17281	MEAN	47.2	MAX	147	MIN	20	AC-FT	34280
WTR YR	2009	TOTAL	15960	MEAN	43.7	MAX	122	MIN	19	AC-FT	31660

MAX DISCH: 135 CFS AT 10:15 ON Jul. 02,2009 GH 1.7 FT. SHIFT 0 FT.

MAX GH: 1.7 FT. AT 10:15 ON Jul. 02,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08250000 CULEBRA CREEK AT SAN LUIS
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
08251500 RIO GRANDE RIVER NEAR LOBATOS
Water Year 2009

Location.-- Lat. 37°04'43", Long. 105°45'23", UTM X 432718.9, Y 4103860.9, in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, T.33 N., R.II E., Conejos County, Hydrologic Unit 13010002, on right bank at highway bridge, 5.7 mi north of Colorado-New Mexico State line, 8 mi downstream from Culebra Creek, 11 mi east of Lobatos, and 14 mi east of Antonito.

Drainage and Period of Record.-- 7,700 mi², approximately, includes 2,940 mi² in closed basin in northern part of San Luis Valley, Colo. June 28, 1899-Nov. 7, 1910, non-recording gage; Nov. 8, 1910, water stage recorder, at present site and datum.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8200 DCP) and a float-operated shaft encoder, water temperature sensor, and tipping bucket rain gauge in a four foot square timber shelter and cobblestone well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. Unreadable auxiliary outside slope gage. On Aug. 9, 2009, the data collection platform was upgraded to a Sutron model Satlink 2 and the shaft encoder was replaced with a Sutron SDR.

Hydrographic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods when the stage-discharge relation was affected by ice: Nov. 6-8, 22, 24-27, 30, Dec. 1, 2, 4-31, 2008, Jan. 1 – Feb. 22, 2009. Two instrumentation corrections were made to the shaft encoder during the year. A +0.04 ft. correction was made on May 11, 2009 due to the tape slightly slipping off of the float wheel pins. This correction was prorated by time based on comparison with chart record. A -0.01 ft. correction was made on May 20, 2009. This correction was prorated by time from the previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 12, 2009 using B.M. No. 2 as base. The gage was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.

Rating.-- The control is composed of boulders and cobbles. Shifting is caused by movement of sand, silt, and gravel in the streambed, and by seasonal heavy weed and moss growth. Rating No. 3, in use since May 1, 1965, was used again this year. This rating is probably not very well defined due to the constant growth and death cycles of weeds and moss as well as heavy silt deposition due to this growth. There is only a brief period of time after ice goes out and scour the channel and before heavy aquatic growth begins that the true stage-discharge relation is not influenced by other factors. Twenty-seven measurements (118-144) were made this year ranging in discharge from 35.8 to 2270 cfs. They cover the discharge range experienced except for lower daily flows on Aug. 10, Sep. 3-10, 2009; and the higher daily flows on May 10, 11, 2009. The peak flow of 2500 cfs occurred at 14:30 on May 10, 2009 at a gage-height of 4.20 feet (GH corr. +0.04 ft. applied) with a shift of -0.27 feet. It exceeded high measurement No. 133 (GH=4.04), made May 11, 2009 by 0.16 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Two variable shift curves were used to define the stage -shift relation at different periods during the weed growth cycle. RIOLOBVS0901 was used from Apr. 15 to May 11, 2009 and RIOLOBVS0902 was used from Jun. 22 to Aug. 17, 2009. Both shift curves were left open-ended at the top since there was no evidence to indicate shifts trending back toward the rating. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts varied from -0.71 to +0.06 feet. All measurements were given full weight and applied except No. 129, which was adjusted 3% to smooth shift distribution. Measurement No. 145, the first measurement of WY2010 was not used due to very poor measurement conditions (high winds causing white caps moving upstream).

Special Computations.-- Discharge for periods of ice-affected record was estimated using six measurements, weather records, trends, and comparison with the stations Rio Grande near Cerro, New Mexico, and Rio Grande near Taos Junction Bridge, New Mexico minus the Red River near Questa, New Mexico. A hydrograph was used.

Remarks.-- Due to the high frequency of measurements, the record is considered good, except for periods of ice-affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08251500 RIO GRANDE RIVER NEAR LOBATOS

RATING TABLE--

RIOLOBCO03 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

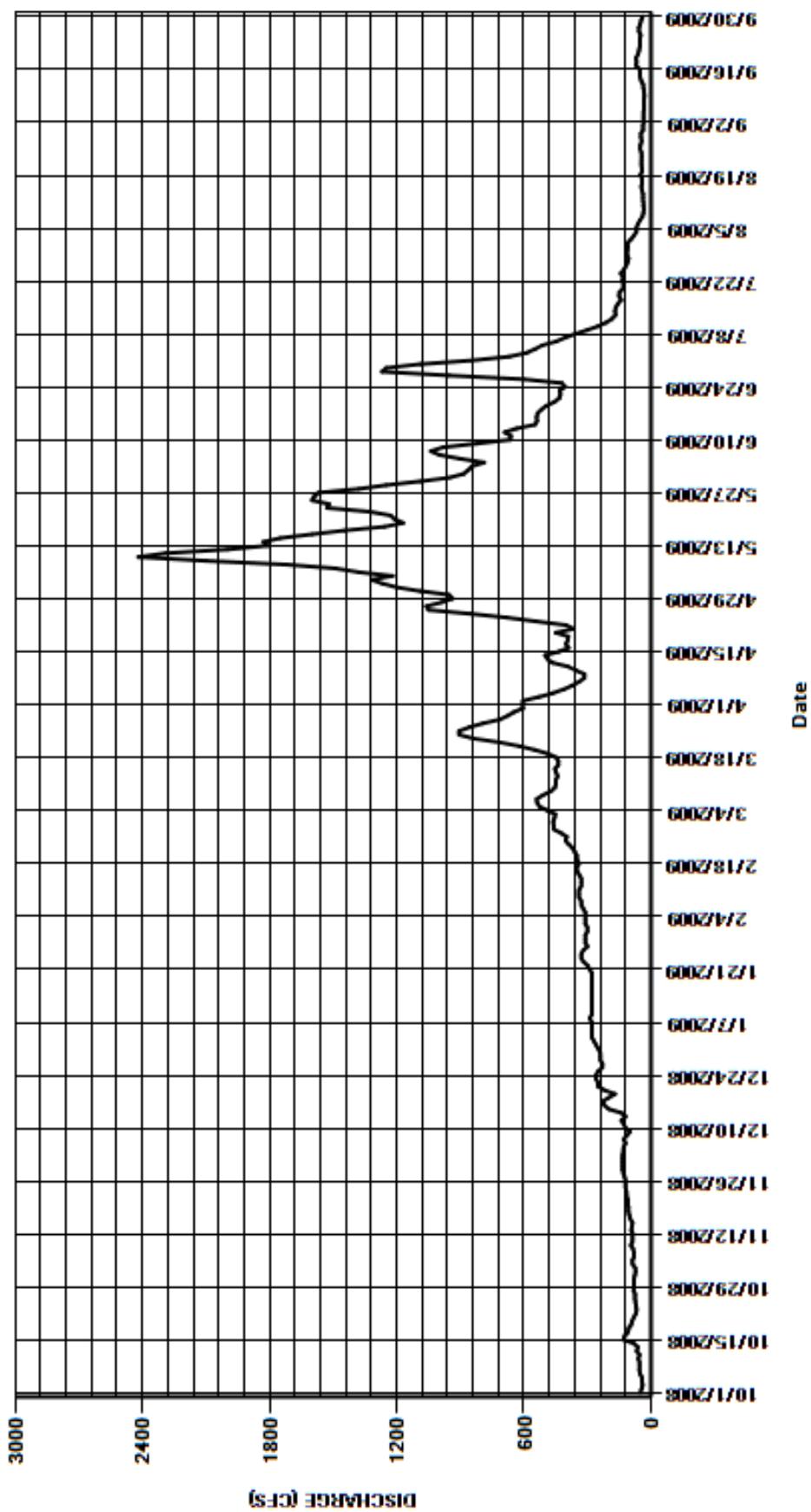
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	77	135	260	300	462	608	1090	884	845	111	38
2	45	73	135	270	310	456	604	1200	863	669	95	36
3	40	75	134	280	310	452	529	1270	845	586	81	35
4	43	87	130	280	310	491	463	1320	788	548	69	35
5	43	88	130	280	310	526	412	1220	901	513	69	35
6	52	80	120	280	320	538	373	1380	998	448	63	34
7	55	80	130	280	330	540	340	1490	1040	406	53	35
8	54	85	115	290	330	511	315	1720	983	358	41	33
9	54	95	100	280	340	474	314	2100	823	302	36	32
10	60	88	120	280	340	454	354	2420	665	251	34	33
11	54	87	130	280	340	449	391	2290	661	212	36	36
12	68	87	140	280	330	450	464	2000	691	184	37	38
13	62	93	120	280	330	441	489	1810	634	168	38	47
14	80	90	140	280	330	448	500	1830	548	170	38	52
15	130	88	200	280	340	454	434	1750	538	167	43	52
16	125	98	220	280	350	438	389	1600	540	156	46	54
17	109	103	230	280	350	438	402	1450	536	141	42	71
18	106	107	200	280	340	447	393	1260	518	151	42	69
19	94	107	170	280	350	487	391	1170	494	150	51	71
20	89	110	220	280	350	549	450	1210	456	131	42	61
21	81	109	250	290	360	622	364	1230	433	130	44	57
22	71	115	250	300	370	716	401	1330	428	136	46	53
23	69	116	260	320	388	838	544	1530	431	131	45	52
24	71	120	260	330	404	906	682	1520	406	143	44	53
25	74	120	250	330	398	906	854	1600	421	128	46	49
26	76	120	230	320	425	857	1050	1590	601	118	52	57
27	75	125	230	300	459	793	1060	1570	953	110	50	57
28	83	130	240	310	460	715	990	1380	1270	107	44	51
29	80	135	240	310	---	677	937	1250	1250	114	48	47
30	80	135	240	310	---	647	954	1090	1090	112	48	39
31	81	---	250	300	---	604	---	951	---	110	37	---
TOTAL	2256	3023	5719	9000	9874	17786	16451	46621	21689	7895	1571	1412
MEAN	72.8	101	184	290	353	574	548	1504	723	255	50.7	47.1
AC-FT	4470	6000	11340	17850	19590	35280	32630	92470	43020	15660	3120	2800
MAX	130	135	260	330	460	906	1060	2420	1270	845	111	71
MIN	40	73	100	260	300	438	314	951	406	107	34	32
CAL YR	2008	TOTAL	198573	MEAN	543	MAX	2870	MIN	40	AC-FT	393900	
WTR YR	2009	TOTAL	143297	MEAN	393	MAX	2420	MIN	32	AC-FT	284200	

MAX DISCH: 2500 CFS AT 14:30 ON May. 10,2009 GH 4.2 FT. SHIFT -0.27 FT. (GH CORR. +0.04 FT. APPLIED)

MAX GH: 4.2 FT. AT 14:30 ON May. 10,2009 (GH CORR. +0.04 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08251500 RIO GRANDE RIVER NEAR LOBATOS
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
09118200 TARBELL DITCH NEAR COCHETOPA PASS
Water Year 2009

Location.-- UTM X 342475.3, Y 4206500.5; Tarbell ditch diverts water from Lake Fork Cochetopa Creek (tributary to Cochetopa Creek), in NW $\frac{1}{4}$ sec. 18, T.43 N., R.2 E., in Gunnison River basin, to Lake Fork Creek (tributary to Middle Fork Saguache Creek) in NE $\frac{1}{4}$ sec. 18, T.43 N., R.2 E., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Electronic data logger with satellite transmitter, which records gage-height data from a float-operated shaft encoder in a lumber shelter and steel culvert pipe stilling well. A Stevens F-type chart recorder is also occasionally used. One intake pipe attaches well to 2.5 foot Parshall flume.

Hydrographic Conditions.-- Tarbell Ditch diverts water from Lake Fork Cochetopa Creek (tributary to Cochetopa Creek) in the Gunnison River drainage (Division 4) into the Rio Grande River drainage (Division 3).

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable from Jun. 1, 2009 when diversion started to Aug. 19, 2009 when diversion stopped. There was no flow from Oct. 1, 2008 to May 31, 2009 and from Aug. 20 to Sep. 30, 2009. Chart record was used as primary record from Jun. 1 to 11, 2009, before the satellite system was started.

Datum Corrections.-- The flume is in fair condition. The measured depths on measurement #38, made Jun. 11, 2009, indicate that flume floor is fairly level laterally. However, it was noted that both flume walls are leaning from left to right. There is also a large flat rock placed at left side of flume entrance to prevent erosion, which affects velocities at left edge of flume.

Rating.-- Rating TARBELCO01, a standard 2.5 foot Parshall flume rating, was used all year. Sediment and rock above flume cause minor shifting. One discharge measurement (No. 38) was made this year, with a discharge of 3.91 cfs. The peak flow of 7.06 cfs occurred at 4:15 on Jun. 14, 2009 at a gage-height of 0.85 ft with a shift of -0.05 ft. This peak appears to have been caused by the channel or gate structure above flume temporarily plugging and releasing. There was an identical peak gage-height and flow on Jul. 21, 2009 caused by a rain event. Both peaks exceeded measurement No. 38, made Jun. 11, 2009, by 0.25 ft in stage.

Discharge.-- The measured shift (-0.05 feet) was distributed through the entire period of record. Discharge measurements (Nos. 34 to 38) indicate that the shift of -0.05 feet would be accurate through the range in stage encountered.

Special Computations.--

Remarks.-- Record is good. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09118200 TARBELL DITCH NEAR COCHETOPA PASS

RATING TABLE--

TARBELCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	2	4.3	2.2	0
2	0	0	0	0	0	0	0	0	4	4.3	2	0
3	0	0	0	0	0	0	0	0	4	4.3	1.9	0
4	0	0	0	0	0	0	0	0	3.9	4.1	1.9	0
5	0	0	0	0	0	0	0	0	4.3	4	1.9	0
6	0	0	0	0	0	0	0	0	5	4.2	1.9	0
7	0	0	0	0	0	0	0	0	4.6	3.9	1.7	0
8	0	0	0	0	0	0	0	0	4.4	3.7	1.6	0
9	0	0	0	0	0	0	0	0	4.4	3.5	1.6	0
10	0	0	0	0	0	0	0	0	4.3	3.5	1.6	0
11	0	0	0	0	0	0	0	0	4	3.5	1.5	0
12	0	0	0	0	0	0	0	0	3.6	3.4	1.5	0
13	0	0	0	0	0	0	0	0	3.7	3.3	1.7	0
14	0	0	0	0	0	0	0	0	4.1	3.1	2	0
15	0	0	0	0	0	0	0	0	4	3	1.6	0
16	0	0	0	0	0	0	0	0	3.9	2.8	1.4	0
17	0	0	0	0	0	0	0	0	4.1	2.7	1.4	0
18	0	0	0	0	0	0	0	0	4.2	2.6	1.3	0
19	0	0	0	0	0	0	0	0	4.3	2.6	0.61	0
20	0	0	0	0	0	0	0	0	4.4	2.5	0	0
21	0	0	0	0	0	0	0	0	4.1	3.4	0	0
22	0	0	0	0	0	0	0	0	4.2	3	0	0
23	0	0	0	0	0	0	0	0	4.5	2.6	0	0
24	0	0	0	0	0	0	0	0	4.6	2.5	0	0
25	0	0	0	0	0	0	0	0	4.7	2.5	0	0
26	0	0	0	0	0	0	0	0	5.4	3.2	0	0
27	0	0	0	0	0	0	0	0	5	2.6	0	0
28	0	0	0	0	0	0	0	0	4.8	2.4	0	0
29	0	0	0	0	---	0	0	0	4.7	2.5	0	0
30	0	0	0	0	---	0	0	0	4.5	2.3	0	0
31	0	---	0	0	---	0	---	0	---	2.5	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	127.7	98.8	31.31	0.00
MEAN	0	0	0	0	0	0	0	0	4.26	3.19	1.01	0
AC-FT	0	0	0	0	0	0	0	0	253	196	62	0
MAX	0	0	0	0	0	0	0	0	5.4	4.3	2.2	0
MIN	0	0	0	0	0	0	0	0	2	2.3	0	0

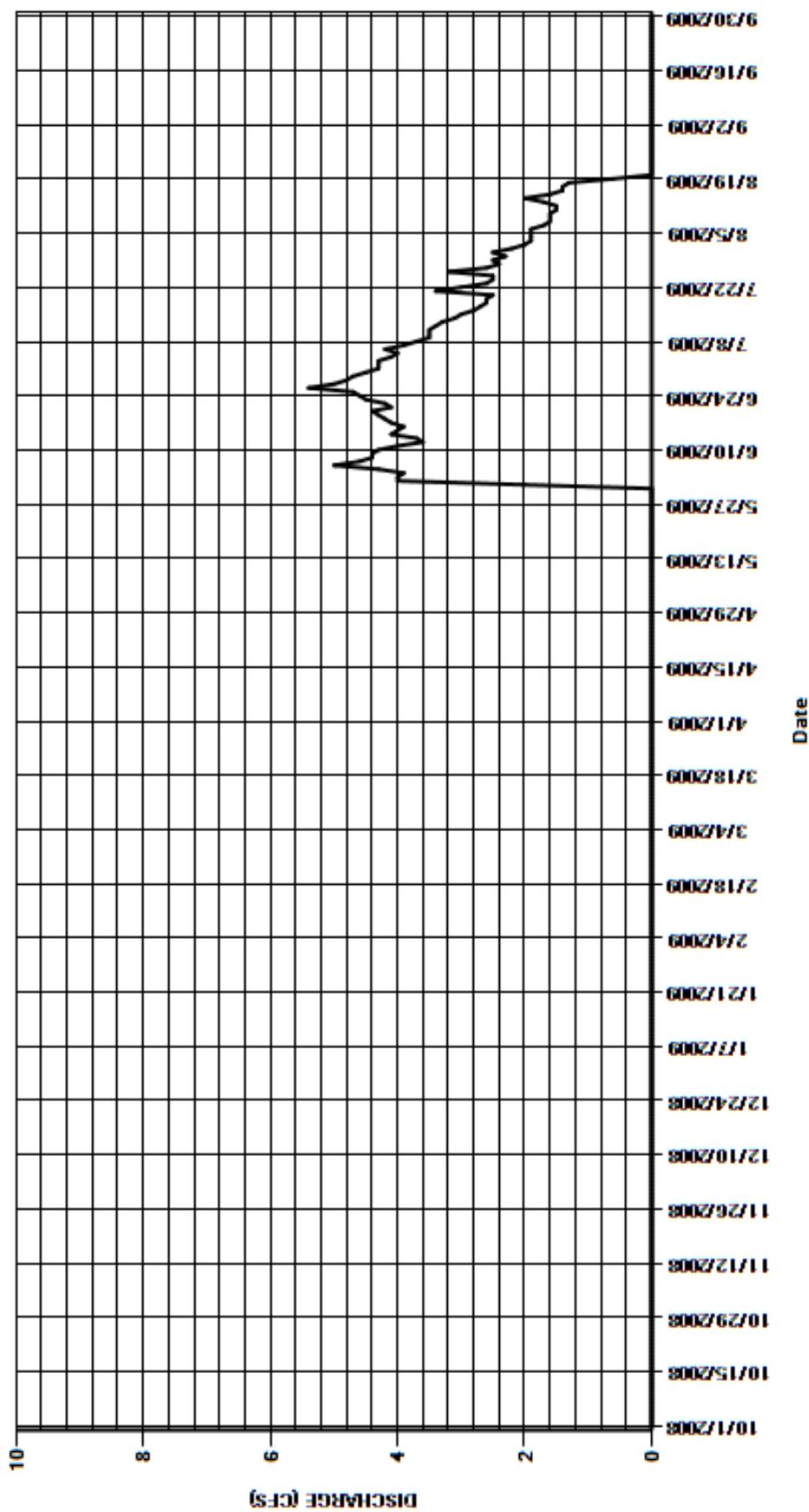
CAL YR	2008	TOTAL	449.92	MEAN	1.23	MAX	10	MIN	0	AC-FT	892
WTR YR	2009	TOTAL	257.81	MEAN	0.71	MAX	5.4	MIN	0	AC-FT	511

MAX DISCH: 7.1 CFS AT 04:15 ON Jun. 14,2009 GH 0.85 FT. SHIFT -0.05 FT.

MAX GH: 0.85 FT. AT 04:15 ON Jun. 14,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09118200 TARBELL DITCH NEAR COCHETOPA PASS
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
09121000 TABOR DITCH AT SPRING CREEK PASS, CO
Water Year 2009

Location.-- Lat. 37°56'22.17", Long. 107°09'30.52", UTM X 310330.0, Y 4201312.0; Tabor ditch diverts water from tributaries of Cebolla Creek in secs, 29 and 36, T.43 N., R.3 W., in Gunnison River basin, to Big Spring Creek (tributary to North Clear Creek) in sec. 35, T.43 N., R.3 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Electronic data logger with satellite transmitter, which records gage-height data from a float-operated shaft encoder in a steel shelter and stilling well. One intake pipe attaches well to 3 foot Parshall flume.

Hydrographic Conditions.-- Tabor Ditch diverts water from tributaries of Cebolla Creek in Gunnison River Basin (Division 4) to Big Spring Creek (tributary to North Clear Creek) in Rio Grande River Basin (Division 3).

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable Oct. 1 to Oct. 23, 2008 (when diversion stopped), except for Oct. 15-23, 2008 when float was affected by ice in well; and May 6, 2009 (when diversion) started to Sep. 30, 2009, except for May 22-26, 2009 due to missing data. The stage-discharge relation was affected by ice Oct. 7-9, 12-14, 2008. The shaft encoder gage-height was 0.10 foot too high on Jun. 16, 2009, so a -0.10 foot correction was prorated by time from previous visit on May 26, 2009. There was no flow from Oct. 17, 2008 to May 5, 2009.

Datum Corrections.-- The flume is in fair condition. Levels run at the flume on July 31, 2008 indicate that the flume throat is approximately 0.07' below the reference point at the staff gage likely due to settlement.

Rating.-- Rating TABDITCO01 was used all year. Settlement of the flume throat section and siltation of the gage pool, which has increased approach velocities, are the likely causes of positive shifting. Nine measurements (Nos. 143-151) were made this year ranging in discharge from 0.58 to 13.0 cfs. Measurements cover the range experienced except for the lower daily flows on Oct. 8-16, 2008; and the higher daily flows on May 11, 12, 2009. The peak flow of 17.5 cfs occurred at 18:45 on May 12, 2009 at a gage height of 1.16 ft. with a shift of +0.11 ft and exceeded high measurement No. 144 (GH=0.94 ft.) made May 8, 2009 by 0.22 ft. in stage.

Discharge.-- The variable shift curve TABDITVS0801 from WY2008 was continued in use Oct. 1 to Oct. 23, 2008 when diversion was stopped. Variable shift curve TABDITVS0901 was used from May 6, 2009 when diversion started to Sep. 30, 2009. This year's measurements show shifts varied between +0.07 and +0.11 ft. All were given full weight and used to develop the shift curves.

Special Computations.--

Remarks.-- Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09121000 TABOR DITCH AT SPRING CREEK PASS, CO

RATING TABLE--

TABDITCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.62	0	0	0	0	0	0	0	4.2	2.8	1.1	0.61
2	0.62	0	0	0	0	0	0	0	4	2.9	1.1	0.61
3	0.62	0	0	0	0	0	0	0	3.9	2.8	0.99	0.61
4	0.63	0	0	0	0	0	0	0	3.9	2.7	0.94	0.61
5	0.63	0	0	0	0	0	0	0	3.9	2.7	0.96	0.61
6	0.62	0	0	0	0	0	0	3.9	4	2.5	0.91	0.61
7	0.6	0	0	0	0	0	0	10	3.6	2.4	0.84	0.61
8	0.55	0	0	0	0	0	0	13	3.5	2.3	0.77	0.61
9	0.55	0	0	0	0	0	0	13	3.2	2.2	0.77	0.61
10	0.57	0	0	0	0	0	0	13	3.2	2.1	0.74	0.66
11	0.57	0	0	0	0	0	0	14	3	2	0.72	0.62
12	0.5	0	0	0	0	0	0	14	2.9	2	0.72	0.61
13	0.4	0	0	0	0	0	0	13	2.9	2	0.76	0.62
14	0.4	0	0	0	0	0	0	12	3.2	1.8	0.89	0.61
15	0.4	0	0	0	0	0	0	11	2.9	1.7	0.72	0.61
16	0.5	0	0	0	0	0	0	9.6	2.9	1.6	0.69	0.61
17	0	0	0	0	0	0	0	9.7	3	1.5	0.68	0.61
18	0	0	0	0	0	0	0	8.4	2.9	1.4	0.68	0.61
19	0	0	0	0	0	0	0	7.3	2.9	1.4	0.66	0.61
20	0	0	0	0	0	0	0	6.2	2.9	1.3	0.65	0.62
21	0	0	0	0	0	0	0	5.4	2.8	1.4	0.64	0.61
22	0	0	0	0	0	0	0	5.3	2.8	1.3	0.62	0.62
23	0	0	0	0	0	0	0	5.2	2.8	1.2	0.62	0.6
24	0	0	0	0	0	0	0	5.1	2.9	1.1	0.71	0.6
25	0	0	0	0	0	0	0	5	3	1.2	0.73	0.61
26	0	0	0	0	0	0	0	4.9	3.2	1.5	0.66	0.59
27	0	0	0	0	0	0	0	4.9	3.2	1.3	0.64	0.61
28	0	0	0	0	0	0	0	4.5	3.6	1.2	0.62	0.61
29	0	0	0	0	---	0	0	4.3	3.1	1.2	0.61	0.61
30	0	0	0	0	---	0	0	4.2	3	1.2	0.61	0.6
31	0	---	0	0	---	0	---	4.3	---	1.2	0.61	---
TOTAL	8.78	0.00	0.00	0.00	0.00	0.00	0.00	211.20	97.3	55.9	23.36	18.34
MEAN	0.28	0	0	0	0	0	0	6.81	3.24	1.8	0.75	0.61
AC-FT	17	0	0	0	0	0	0	419	193	111	46	36
MAX	0.63	0	0	0	0	0	0	14	4.2	2.9	1.1	0.66
MIN	0	0	0	0	0	0	0	0	2.8	1.1	0.61	0.59

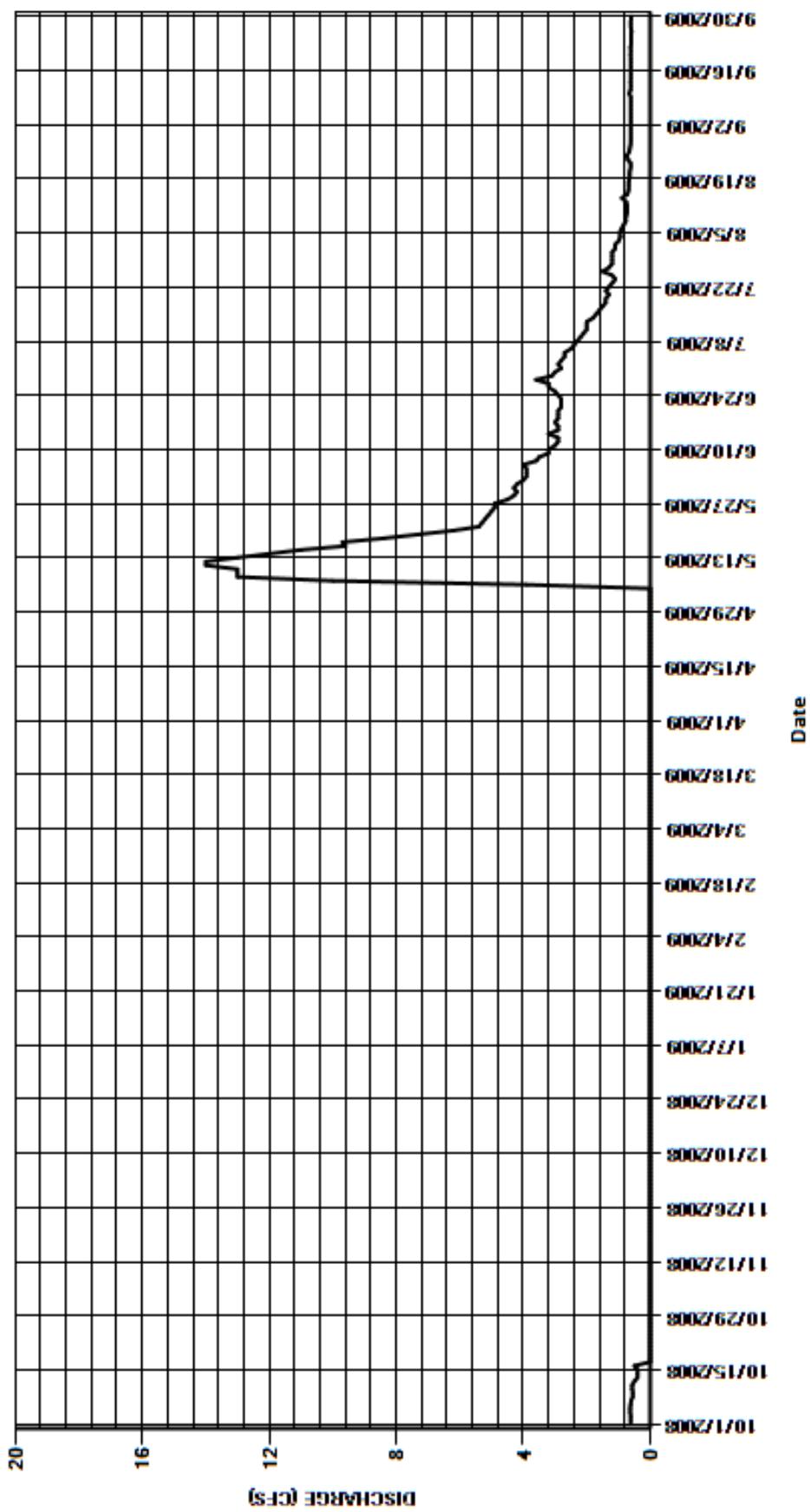
CAL YR	2008	TOTAL	518.69	MEAN	1.42	MAX	15	MIN	0	AC-FT	1030
WTR YR	2009	TOTAL	414.88	MEAN	1.14	MAX	14	MIN	0	AC-FT	823

MAX DISCH: 18 CFS AT 18:45 ON May. 12,2009 GH 1.16 FT. SHIFT 0.11 FT.

MAX GH: 1.16 FT. AT 18:45 ON May. 12,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09121000 TABORDITCH AT SPRING CREEK PASS, CO
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
09341000 TREASURE PASS DITCH AT WOLF CREEK PASS
Water Year 2009

Location.-- Treasure Pass diversion ditch diverts water from tributaries of Wolf Creek in San Juan River basin, to tributary of South Fork Rio Grande in sec. 5, T.37 N., R.2 E., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Float-operated Stevens F-type chart recorder in a CMP shelter and stilling well. One intake pipe attaches well to 2 foot Parshall flume.

Hydrographic Conditions.-- Treasure Pass diversion ditch diverts water from tributaries of Wolf Creek in San Juan River Basin (Division 7) to tributary of South Fork Rio Grande in the Rio Grande River Basin (Division 3).

Gage-Height Record.-- Record is complete and reliable from May 6, 2009 when diversion started to Jul. 7, 2009 when flow ceased. There was no flow from Oct. 1, 2008 to May 5, 2009 and from Jul. 8 to Sep. 30, 2009.

Datum Corrections.-- The flume is in poor condition. It is not level and the cross-bars in the converging and diverging sections are bent indicating that flume walls are leaning inward. There is not much of a stilling pool above flume so approach velocity is high.

Rating.-- Rating TREDITCO01, a standard 2 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause shifting. One discharge measurement (No. 27) was made this year, with a discharge of 3.53 cfs. The peak flow of 6.11 cfs occurred at 0:45 on May 22, 2009 at a gage-height of 0.77 feet with a shift of +0.07 feet. The peak exceeded measurement No. 27, made May 26, 2009, by 0.25 ft in stage.

Discharge.-- The measured shift (+0.07 feet) was distributed through the entire period of record. Discharge measurements (Nos. 25 to 27) indicate that the shift of +0.07 feet would be accurate through all ranges in stage encountered except for the extreme low stages.

Special Computations.--

Remarks.-- Record is good, except for the periods of May 6-21, 2009 and Jul. 2-7, 2009, which were rated fair due to uncertainty in shift at low stages. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09341000 TREASURE PASS DITCH AT WOLF CREEK PASS

RATING TABLE--

TREDITCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	3.2	1.2	0	0
2	0	0	0	0	0	0	0	0	2.9	1.1	0	0
3	0	0	0	0	0	0	0	0	2.8	1.2	0	0
4	0	0	0	0	0	0	0	0	3.2	1.1	0	0
5	0	0	0	0	0	0	0	0	3.2	1.1	0	0
6	0	0	0	0	0	0	0	0.38	3.3	1.1	0	0
7	0	0	0	0	0	0	0	0.71	3.1	0.54	0	0
8	0	0	0	0	0	0	0	0.88	2.7	0	0	0
9	0	0	0	0	0	0	0	0.88	2.3	0	0	0
10	0	0	0	0	0	0	0	0.93	2	0	0	0
11	0	0	0	0	0	0	0	0.93	1.5	0	0	0
12	0	0	0	0	0	0	0	0.88	1.2	0	0	0
13	0	0	0	0	0	0	0	0.82	1.4	0	0	0
14	0	0	0	0	0	0	0	0.88	1.7	0	0	0
15	0	0	0	0	0	0	0	0.82	1.9	0	0	0
16	0	0	0	0	0	0	0	0.77	2.1	0	0	0
17	0	0	0	0	0	0	0	0.82	2.2	0	0	0
18	0	0	0	0	0	0	0	0.99	2.2	0	0	0
19	0	0	0	0	0	0	0	0.88	2.2	0	0	0
20	0	0	0	0	0	0	0	0.82	2.5	0	0	0
21	0	0	0	0	0	0	0	1.8	2.4	0	0	0
22	0	0	0	0	0	0	0	5.7	2.2	0	0	0
23	0	0	0	0	0	0	0	5.1	2.1	0	0	0
24	0	0	0	0	0	0	0	5.4	2.1	0	0	0
25	0	0	0	0	0	0	0	4.5	2.2	0	0	0
26	0	0	0	0	0	0	0	3.5	3	0	0	0
27	0	0	0	0	0	0	0	3	2.9	0	0	0
28	0	0	0	0	0	0	0	2.7	2.9	0	0	0
29	0	0	0	0	---	0	0	2.7	2.7	0	0	0
30	0	0	0	0	---	0	0	2.7	2	0	0	0
31	0	---	0	0	---	0	---	3.1	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.59	72.1	7.34	0.00	0.00
MEAN	0	0	0	0	0	0	0	1.7	2.4	0.24	0	0
AC-FT	0	0	0	0	0	0	0	104	143	15	0	0
MAX	0	0	0	0	0	0	0	5.7	3.3	1.2	0	0
MIN	0	0	0	0	0	0	0	0	1.2	0	0	0

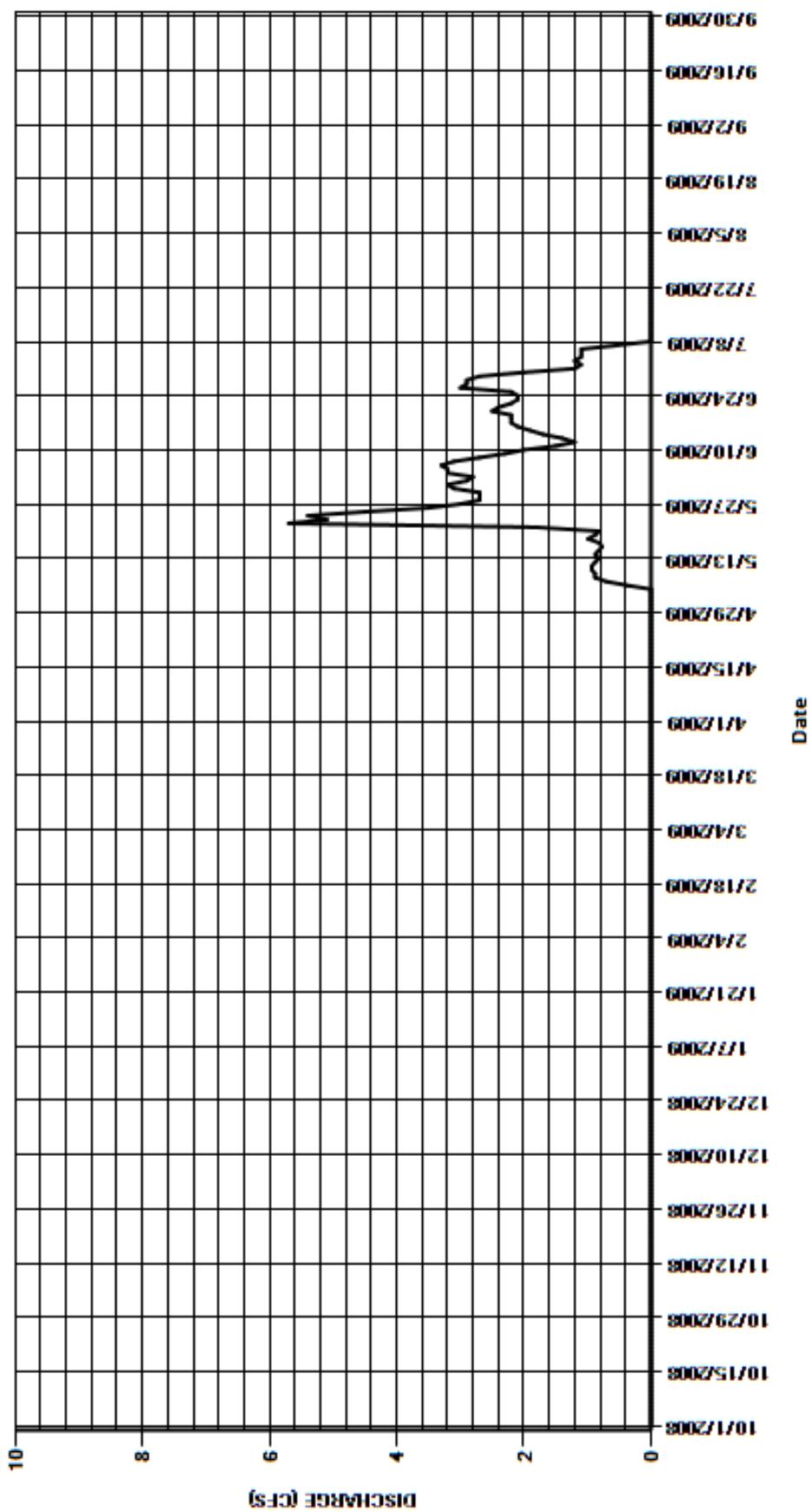
CAL YR	2008	TOTAL	61.03	MEAN	0.17	MAX	4.2	MIN	0	AC-FT	121
WTR YR	2009	TOTAL	132.03	MEAN	0.36	MAX	5.7	MIN	0	AC-FT	262

MAX DISCH: 6.1 CFS AT 00:45 ON May. 22,2009 GH 0.77 FT. SHIFT 0.07 FT.

MAX GH: 0.77 FT. AT 00:45 ON May. 22,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09341000 TREASURE PASS DITCH AT WOLF CREEK PASS
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
DON LA FONT DITCH NO. 1 AT PIEDRA PASS
Water Year 2009

Location.-- SW $\frac{1}{4}$ sec. 33, T.39 N., R.1 W., at Piedra Pass, Co. Diversion is from tributaries of Piedra River Basin to Red Mountain Creek in Rio Grande River Basin.

Drainage and Period of Record.-- N/A

Equipment.-- Float-operated Sutron SDR data logger in a wood shelter and metal pipe stilling well. One intake pipe attaches well to 9 inch Parshall flume.

Hydrographic Conditions.-- Diversion is from tributaries of Piedra River in San Juan River Basin (Division 7) to Red Mountain Creek in Rio Grande River Basin (Division 3).

Gage-Height Record.-- Primary record is hourly averages of 15-minute SDR log data. Record is complete and reliable from Jun. 4, 2009 when diversion started to Jun. 30, 2009 when diversion and data logger were shut down. There was no flow from Oct. 1, 2008 to Jun. 3, 2009 and from Jul. 1 to Sep. 30, 2009.

Datum Corrections.-- The flume is in good condition.

Rating.-- Rating DLFDT1CO02, a standard 9 inch Parshall flume rating, was used all year. Changes in approach conditions above flume cause minor shifting. There were no discharge measurements made this year. The last measurement was made on Jul. 7, 2005 and resulted in a shift of -0.03 feet. The peak flow of 1.86 cfs occurred at 14:45 on Jun. 4, 2009 at a gage-height of 0.75 feet with a shift of -0.03 feet.

Discharge.-- The last measured shift (-0.03 feet) was distributed through the entire period of record.

Special Computations.--

Remarks.-- Record is rated fair since there were no discharge measurements made this water year and past measurements show considerable shift variability. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DON LA FONT DITCH NO. 1 AT PIEDRA PASS

RATING TABLE-- DLFDT1CO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0.74	0	0	0
5	0	0	0	0	0	0	0	0	1.3	0	0	0
6	0	0	0	0	0	0	0	0	1.2	0	0	0
7	0	0	0	0	0	0	0	0	0.98	0	0	0
8	0	0	0	0	0	0	0	0	0.9	0	0	0
9	0	0	0	0	0	0	0	0	0.74	0	0	0
10	0	0	0	0	0	0	0	0	0.65	0	0	0
11	0	0	0	0	0	0	0	0	0.68	0	0	0
12	0	0	0	0	0	0	0	0	0.65	0	0	0
13	0	0	0	0	0	0	0	0	0.66	0	0	0
14	0	0	0	0	0	0	0	0	0.7	0	0	0
15	0	0	0	0	0	0	0	0	0.72	0	0	0
16	0	0	0	0	0	0	0	0	0.68	0	0	0
17	0	0	0	0	0	0	0	0	0.66	0	0	0
18	0	0	0	0	0	0	0	0	0.61	0	0	0
19	0	0	0	0	0	0	0	0	0.56	0	0	0
20	0	0	0	0	0	0	0	0	0.65	0	0	0
21	0	0	0	0	0	0	0	0	0.52	0	0	0
22	0	0	0	0	0	0	0	0	0.42	0	0	0
23	0	0	0	0	0	0	0	0	0.38	0	0	0
24	0	0	0	0	0	0	0	0	0.37	0	0	0
25	0	0	0	0	0	0	0	0	0.4	0	0	0
26	0	0	0	0	0	0	0	0	0.5	0	0	0
27	0	0	0	0	0	0	0	0	0.41	0	0	0
28	0	0	0	0	0	0	0	0	0.39	0	0	0
29	0	0	0	0	---	0	0	0	0.35	0	0	0
30	0	0	0	0	---	0	0	0	0.14	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.96	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	0.57	0	0	0
AC-FT	0	0	0	0	0	0	0	0	34	0	0	0
MAX	0	0	0	0	0	0	0	0	1.3	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

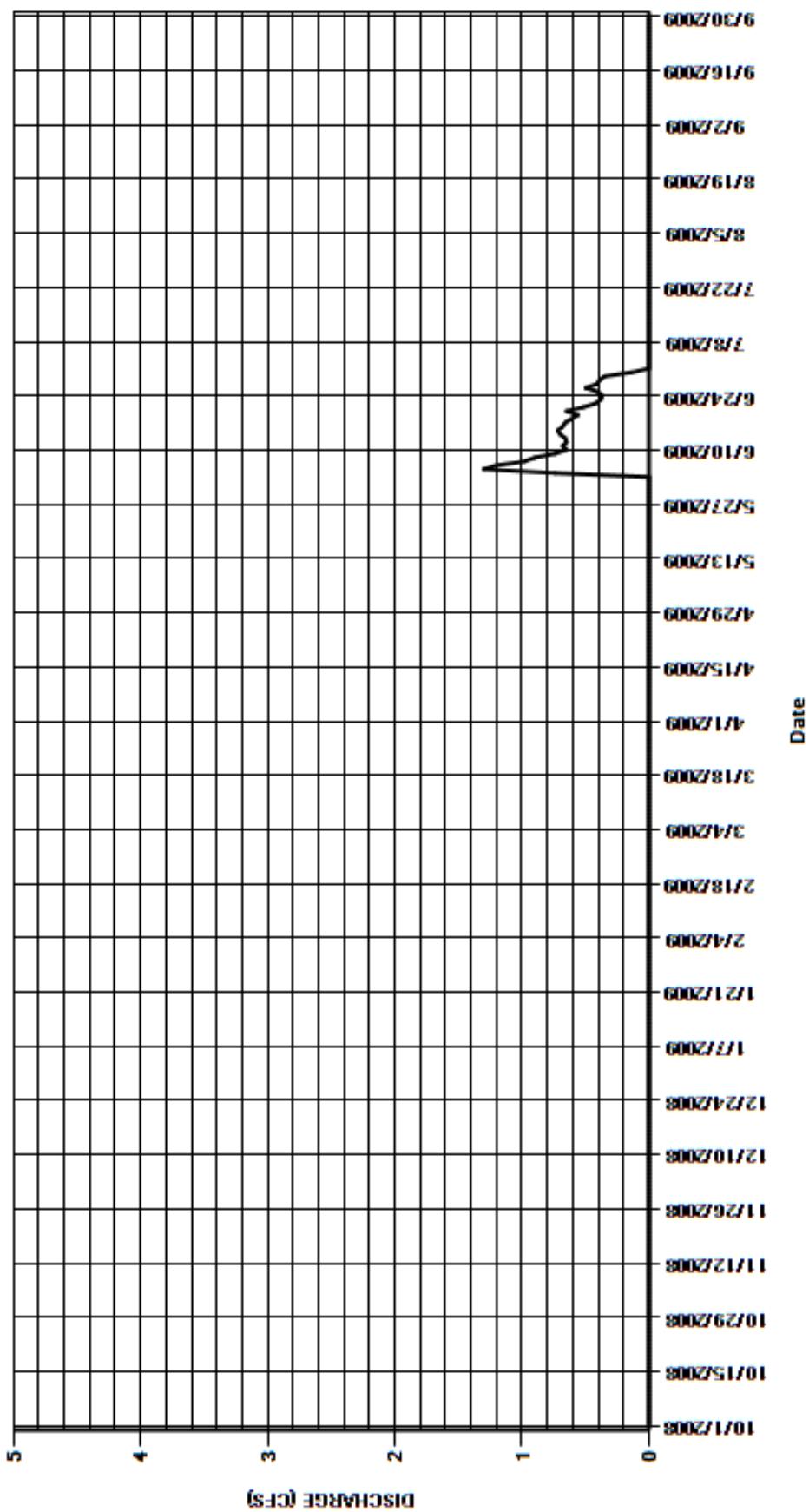
CAL YR	2008	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0
WTR YR	2009	TOTAL	16.96	MEAN	0.046	MAX	1.3	MIN	0	AC-FT	34

MAX DISCH: 1.9 CFS AT 14:45 ON Jun. 04,2009 GH 0.75 FT. SHIFT -0.03 FT.

MAX GH: 0.75 FT. AT 14:45 ON Jun. 04,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DON LA FONT DITCH NO. 1 AT PIEDRA PASS
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS
Water Year 2009

Location.-- UTM X 323469, Y 4159709, at Piedra Pass, Co. Diversion is from tributaries of Piedra River in San Juan River Basin to Red Mountain Creek in Rio Grande River Basin.

Drainage and Period of Record.-- N/A

Equipment.-- Float-operated Sutron SDR data logger and satellite monitoring HDR DCP in a wood shelter and metal pipe stilling well. One intake pipe attaches well to 1.5 foot Parshall flume.

Hydrographic Conditions.-- Ditch diversion is from tributaries of Piedra River in San Juan River Basin (Division 7) to Red Mountain Creek in Rio Grande River Basin (Division 3).

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP and SDR logs as backup. Record is complete and reliable from Jun. 4, 2009 when diversion started to Jun. 30, 2009 when data logger malfunctioned. This condition was not corrected by CDOW, therefore no flow was accounted for after this date. There was no flow from Oct. 1, 2008 to Jun. 3, 2009 and from Jul. 1 to Sep. 30, 2009.

Datum Corrections.-- The flume is in good condition.

Rating.-- Rating DLFDT2CO02, a standard 1.5 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause minor shifting. There were no discharge measurements made this year. The last measurement was made on Jul. 7, 2005 and resulted in a shift of +0.02 feet. The peak flow of 5.91 cfs occurred at 21:00 on Jun. 28, 2009 at a gage-height of 0.97 feet with a shift of +0.02 feet.

Discharge.-- The last measured shift (+0.02 feet) was distributed through the entire period of record.

Special Computations.--

Remarks.-- Record is rated fair since there was no discharge measurement made this water year and past measurements show considerable shift variability. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS

RATING TABLE-- DLFDT2CO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	1.3	0	0	0
5	0	0	0	0	0	0	0	0	2.9	0	0	0
6	0	0	0	0	0	0	0	0	2.9	0	0	0
7	0	0	0	0	0	0	0	0	2.5	0	0	0
8	0	0	0	0	0	0	0	0	2.6	0	0	0
9	0	0	0	0	0	0	0	0	2.2	0	0	0
10	0	0	0	0	0	0	0	0	1.8	0	0	0
11	0	0	0	0	0	0	0	0	1.6	0	0	0
12	0	0	0	0	0	0	0	0	2.2	0	0	0
13	0	0	0	0	0	0	0	0	2.5	0	0	0
14	0	0	0	0	0	0	0	0	2.4	0	0	0
15	0	0	0	0	0	0	0	0	2.7	0	0	0
16	0	0	0	0	0	0	0	0	2.4	0	0	0
17	0	0	0	0	0	0	0	0	2.4	0	0	0
18	0	0	0	0	0	0	0	0	2.4	0	0	0
19	0	0	0	0	0	0	0	0	2.4	0	0	0
20	0	0	0	0	0	0	0	0	2.1	0	0	0
21	0	0	0	0	0	0	0	0	2.1	0	0	0
22	0	0	0	0	0	0	0	0	2.1	0	0	0
23	0	0	0	0	0	0	0	0	1.8	0	0	0
24	0	0	0	0	0	0	0	0	1.7	0	0	0
25	0	0	0	0	0	0	0	0	1.8	0	0	0
26	0	0	0	0	0	0	0	0	2.1	0	0	0
27	0	0	0	0	0	0	0	0	2.4	0	0	0
28	0	0	0	0	0	0	0	0	3.1	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	1.2	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60.60	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	2.02	0	0	0
AC-FT	0	0	0	0	0	0	0	0	120	0	0	0
MAX	0	0	0	0	0	0	0	0	3.1	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

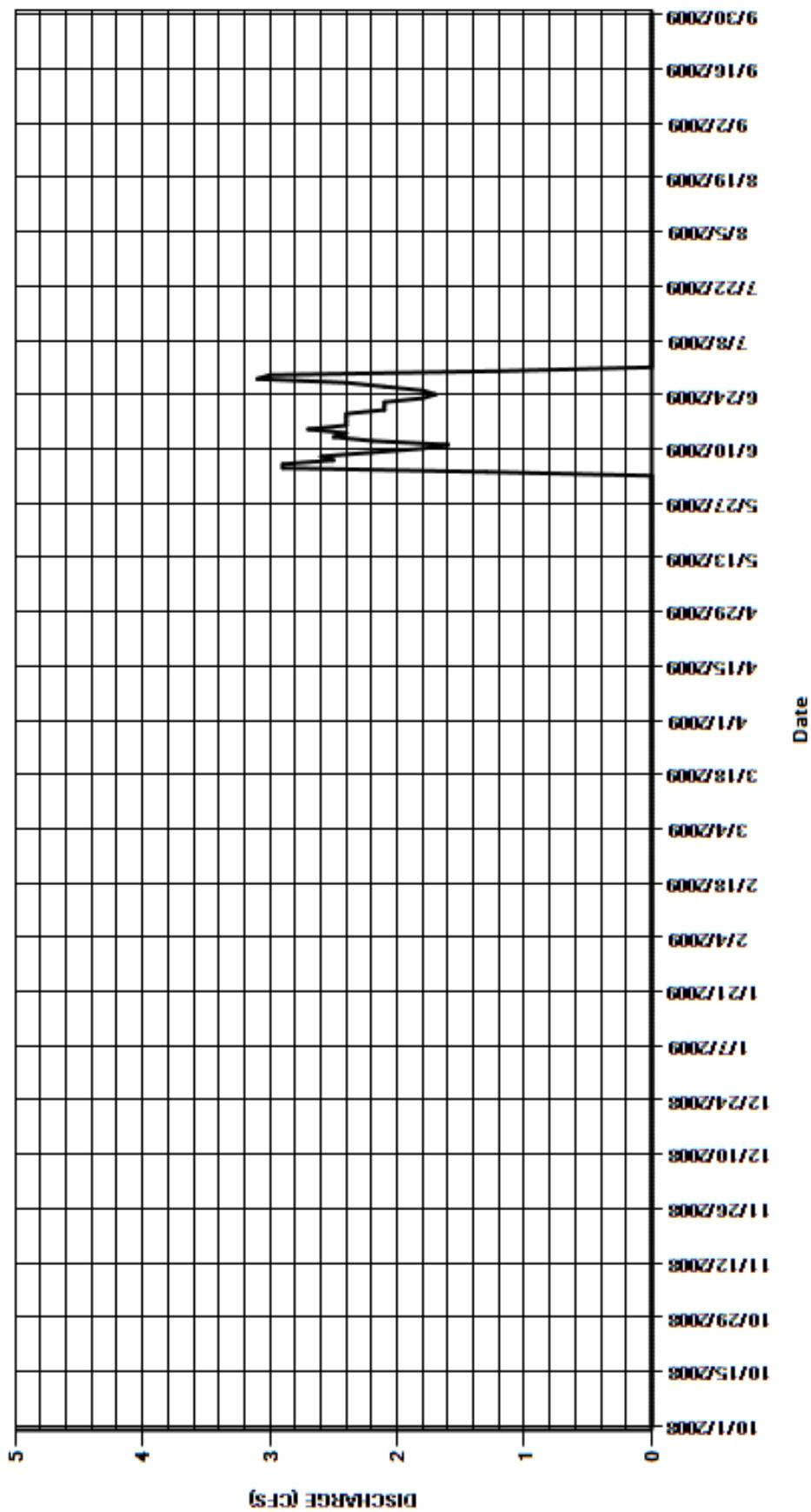
CAL YR	2008	TOTAL	109.78	MEAN	0.3	MAX	4	MIN	0	AC-FT	218
WTR YR	2009	TOTAL	60.60	MEAN	0.17	MAX	3.1	MIN	0	AC-FT	120

MAX DISCH: 5.9 CFS AT 21:00 ON Jun. 28,2009 GH 0.97 FT. SHIFT 0.02 FT.

MAX GH: 0.97 FT. AT 21:00 ON Jun. 28,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09347000 DONLA FONT DITCH NO.2 AT PIEDRA PASS
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
DON LA FONT DITCH AT PIEDRA PASS (COMBINED)
Water Year 2009

Location.-- Don La Font ditches 1 and 2 divert water from tributaries of Piedra River between headgates in NW $\frac{1}{4}$ sec. 4, T.38 N., R.1 W., and SW $\frac{1}{4}$ sec. 33, T.39 N., R.1 W., and Piedra pass, in San Juan River basin, to Red Mountain Creek in sec. 33, T.39 N., R.1 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Combined record is from Don La Font Ditches 1 and 2 gages. See individual records for gage equipment descriptions.

Hydrographic Conditions.-- Don La Font Ditches 1 and 2 divert water from tributaries of Piedra River in San Juan River Basin (Division 7) to Red Mountain Creek in Rio Grande River Basin (Division 3).

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- Daily discharges computed by summing and rounding the individual station daily discharges.

Special Computations.--

Remarks.-- Record is rated fair since there were no discharge measurements made this water year at the individual ditch gages, and past measurements show considerable shift variability. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DON LA FONT DITCH AT PIEDRA PASS (COMBINED)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

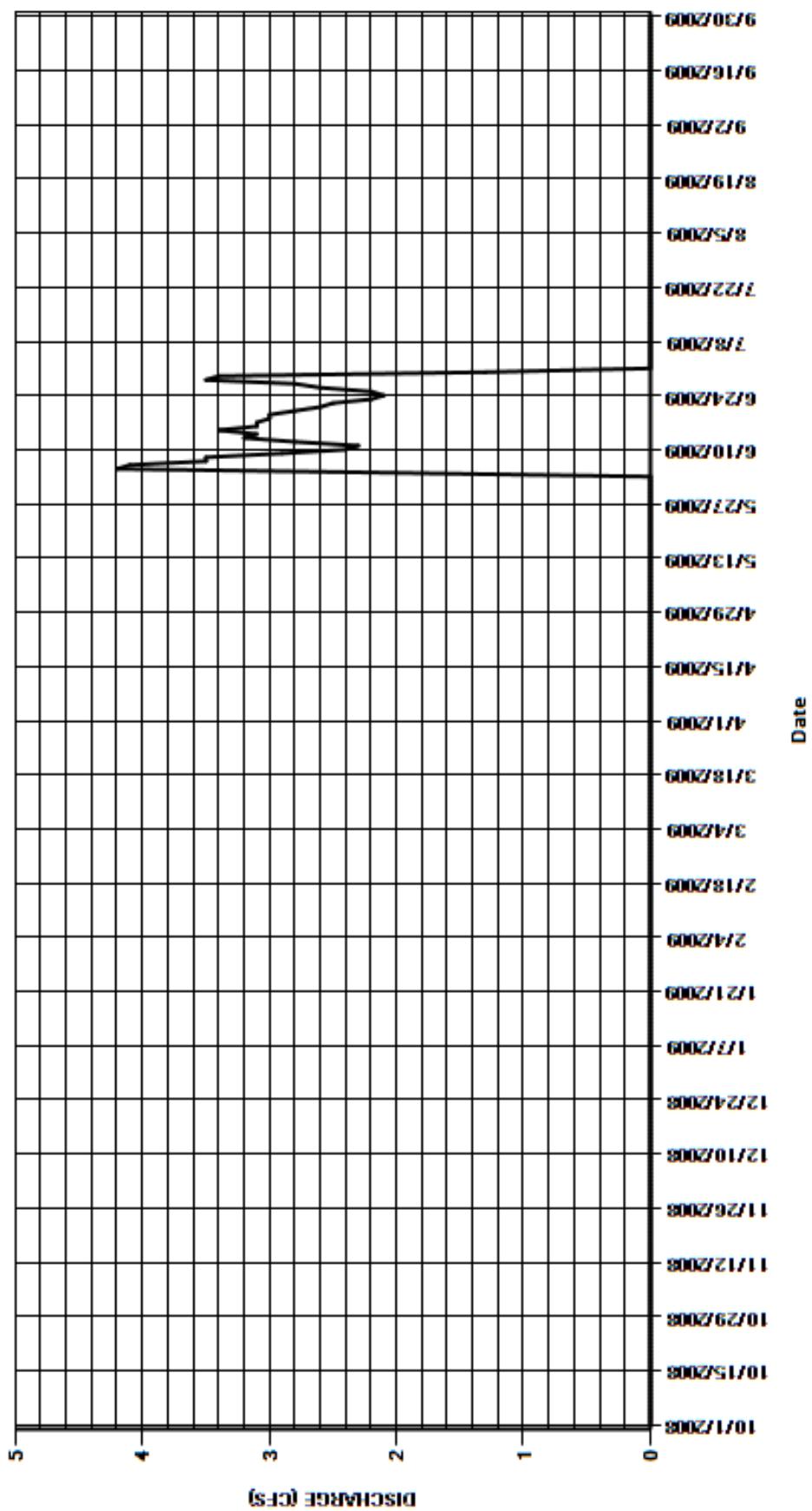
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	2	0	0	0
5	0	0	0	0	0	0	0	0	4.2	0	0	0
6	0	0	0	0	0	0	0	0	4.1	0	0	0
7	0	0	0	0	0	0	0	0	3.5	0	0	0
8	0	0	0	0	0	0	0	0	3.5	0	0	0
9	0	0	0	0	0	0	0	0	2.9	0	0	0
10	0	0	0	0	0	0	0	0	2.4	0	0	0
11	0	0	0	0	0	0	0	0	2.3	0	0	0
12	0	0	0	0	0	0	0	0	2.8	0	0	0
13	0	0	0	0	0	0	0	0	3.2	0	0	0
14	0	0	0	0	0	0	0	0	3.1	0	0	0
15	0	0	0	0	0	0	0	0	3.4	0	0	0
16	0	0	0	0	0	0	0	0	3.1	0	0	0
17	0	0	0	0	0	0	0	0	3.1	0	0	0
18	0	0	0	0	0	0	0	0	3	0	0	0
19	0	0	0	0	0	0	0	0	3	0	0	0
20	0	0	0	0	0	0	0	0	2.8	0	0	0
21	0	0	0	0	0	0	0	0	2.6	0	0	0
22	0	0	0	0	0	0	0	0	2.5	0	0	0
23	0	0	0	0	0	0	0	0	2.2	0	0	0
24	0	0	0	0	0	0	0	0	2.1	0	0	0
25	0	0	0	0	0	0	0	0	2.2	0	0	0
26	0	0	0	0	0	0	0	0	2.6	0	0	0
27	0	0	0	0	0	0	0	0	2.8	0	0	0
28	0	0	0	0	0	0	0	0	3.5	0	0	0
29	0	0	0	0	---	0	0	0	3.4	0	0	0
30	0	0	0	0	---	0	0	0	1.3	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.60	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	2.59	0	0	0
AC-FT	0	0	0	0	0	0	0	0	154	0	0	0
MAX	0	0	0	0	0	0	0	0	4.2	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2008	TOTAL	109.78	MEAN	0.3	MAX	4	MIN	0	AC-FT	218
WTR YR	2009	TOTAL	77.60	MEAN	0.21	MAX	4.2	MIN	0	AC-FT	154

MAX DISCH: N/A -- see record for individual gages
MAX GH: FT. N/A -- see record for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DON LAFONT DITCH AT PIEDRAPASS (COMBINED)
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
Water Year 2009

Location.-- UTM X 304233, Y 4163756, William's Creek-Squaw Pass ditch diverts water from William's Creek (tributary to Piedra River) in sec. 21, T.39 N., R.3 W., in San Juan River basin, to Squaw Creek in sec. 21, T.39 N., R.3 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Electronic data logger with satellite transmitter, which records gage-height data from a float-operated shaft encoder in a wood shelter with metal pipe stilling well. One intake pipe attaches well to 2 foot Parshall flume.

Hydrographic Conditions.-- William's Creek-Squaw Pass Ditch diverts water from William's Creek (tributary to Piedra River) in San Juan River Basin (Division 7) to Squaw Creek in Rio Grande River Basin (Division 3).

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable from May 25, 2009 when diversion started to Sep. 23, 2009 when diversion stopped. The shaft encoder gage-height was set 3.82 feet too high on May 25, 2009. Therefore, a -3.82 feet correction was applied to all gage-heights from May 25 to Jun. 16, 2009 at 07:45. There was no flow from Oct. 1, 2008 to May 24, 2009 and from Sep. 24 to Sep. 30, 2009.

Datum Corrections.-- The flume is in fair condition.

Rating.-- Rating WCSDITCO02 was used all year. Changes in approach conditions above flume and deposition below flume cause minor shifting. One discharge measurement (No. 30) was made this year, with a discharge of 2.05 cfs. This measurement yielded a shift of -0.08 ft due to flume operating at 90% submergence caused by sedimentation below flume. The peak flow of 7.66 cfs occurred at 11:00 on Jun. 26, 2009 at a gage-height of 0.89 ft with a shift of -0.08 ft. This peak appears to have been caused by a local rain event. The peak exceeded measurement No. 30, made Jun. 19, 2009, by 0.44 ft in stage.

Discharge.-- The measured shift (-0.08 feet) was distributed through the entire period of record.

Special Computations.--

Remarks.-- Record is fair due to uncertainty in shift stability caused by possible varying submergence with gage-height and time. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS

RATING TABLE--

WCSDITCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	2.1	1.8	0.34	0.14
2	0	0	0	0	0	0	0	0	2.2	1.8	0.29	0.14
3	0	0	0	0	0	0	0	0	2.5	1.5	0.28	0.14
4	0	0	0	0	0	0	0	0	3.4	1.4	0.26	0.14
5	0	0	0	0	0	0	0	0	3.2	1.3	0.27	0.12
6	0	0	0	0	0	0	0	0	3	1.2	0.29	0.26
7	0	0	0	0	0	0	0	0	2.5	1.1	0.28	0.21
8	0	0	0	0	0	0	0	0	2.9	1	0.22	0.21
9	0	0	0	0	0	0	0	0	2.1	0.96	0.22	0.19
10	0	0	0	0	0	0	0	0	1.5	0.97	0.21	0.2
11	0	0	0	0	0	0	0	0	1.2	0.91	0.18	0.17
12	0	0	0	0	0	0	0	0	1.2	0.83	0.17	0.15
13	0	0	0	0	0	0	0	0	1.8	0.81	0.21	0.39
14	0	0	0	0	0	0	0	0	2.5	0.73	0.37	0.3
15	0	0	0	0	0	0	0	0	2.7	0.66	0.28	0.31
16	0	0	0	0	0	0	0	0	3.3	0.61	0.22	0.29
17	0	0	0	0	0	0	0	0	3.8	0.56	0.21	0.3
18	0	0	0	0	0	0	0	0	3.1	0.51	0.18	0.31
19	0	0	0	0	0	0	0	0	3.4	0.49	0.17	0.34
20	0	0	0	0	0	0	0	0	3.1	0.45	0.15	0.33
21	0	0	0	0	0	0	0	0	2.5	0.46	0.12	0.3
22	0	0	0	0	0	0	0	0	3.1	0.42	0.14	0.39
23	0	0	0	0	0	0	0	0	3.4	0.41	0.14	0.53
24	0	0	0	0	0	0	0	0	3.4	0.39	0.3	0
25	0	0	0	0	0	0	0	0.84	3.1	0.39	0.3	0
26	0	0	0	0	0	0	0	0	1.4	3.6	0.45	0.21
27	0	0	0	0	0	0	0	0	1.3	2.9	0.44	0.17
28	0	0	0	0	0	0	0	0	1.7	2.4	0.41	0.15
29	0	0	0	0	---	0	0	0	2.2	2.1	0.39	0.14
30	0	0	0	0	---	0	0	0	2.8	1.8	0.38	0.2
31	0	---	0	0	---	0	---	2.6	---	0.38	0.17	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.84	79.8	24.11	6.84	5.86
MEAN	0	0	0	0	0	0	0	0.41	2.66	0.78	0.22	0.2
AC-FT	0	0	0	0	0	0	0	25	158	48	14	12
MAX	0	0	0	0	0	0	0	2.8	3.8	1.8	0.37	0.53
MIN	0	0	0	0	0	0	0	0	1.2	0.38	0.12	0

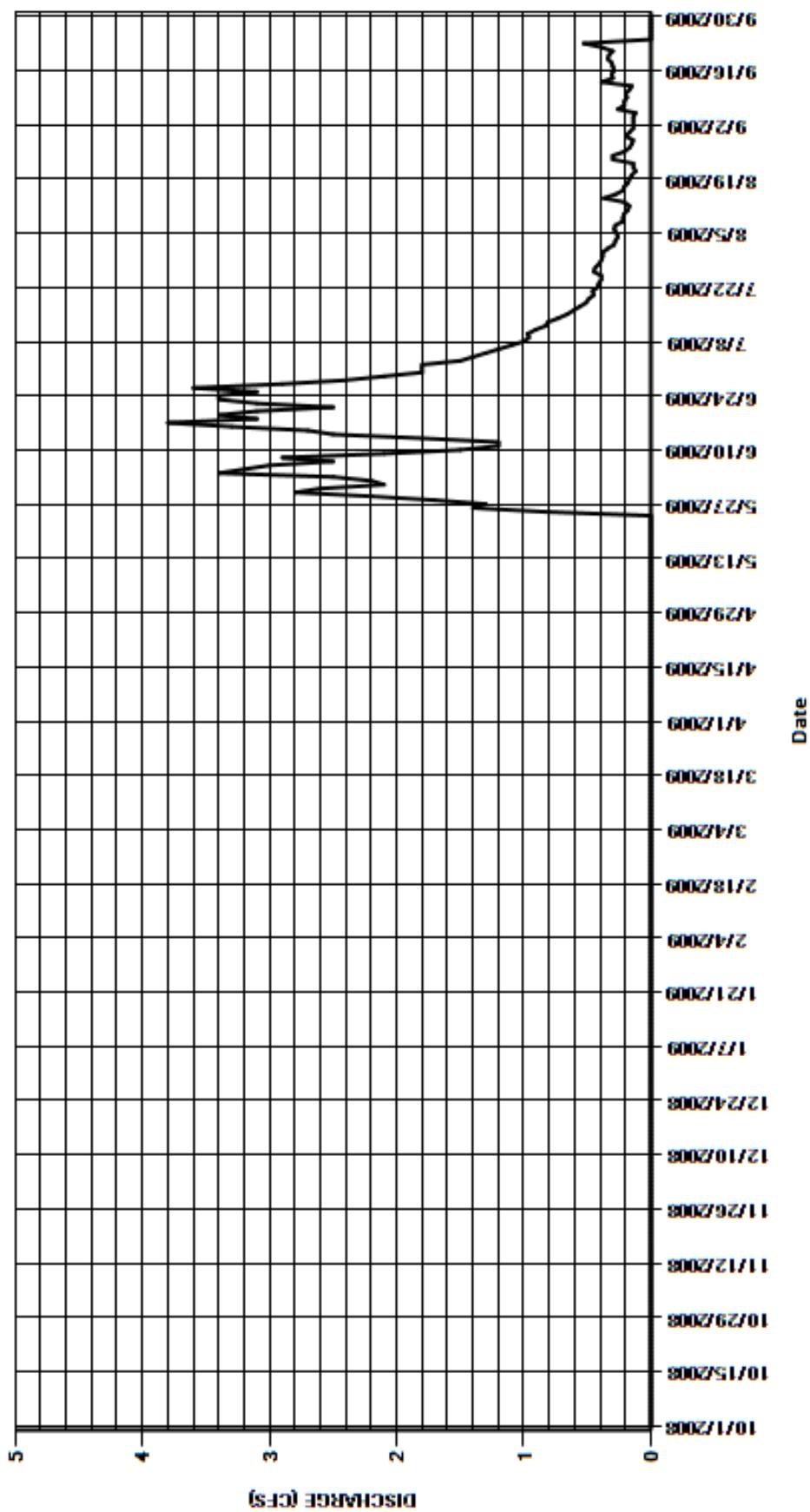
CAL YR	2008	TOTAL	165.40	MEAN	0.45	MAX	5.7	MIN	0	AC-FT	328
WTR YR	2009	TOTAL	129.45	MEAN	0.35	MAX	3.8	MIN	0	AC-FT	257

MAX DISCH: 7.7 CFS AT 11:00 ON Jun. 26,2009 GH 0.89 FT. SHIFT -0.08 FT.

MAX GH: 0.89 FT. AT 11:00 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
Water Year 2009

Location.-- UTM X 295250.0, Y 4171398.3, Pine River-Weminuche Pass ditch diverts water from right bank of north fork of Los Pinos River in sec. 4, T.39 N., R.4 W., in San Juan River basin, to Weminuche Creek in sec. 33, T.40 N., R.4 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder and electronic data logger with satellite transmitter, which records gage-height data from a float-operated shaft encoder in a wood shelter with stilling well. One intake pipe attaches well to 3 foot Parshall flume.

Hydrographic Conditions.-- Pine River-Weminuche Pass Ditch diverts water from right bank of north fork of Los Pinos River in San Juan River Basin (Division 7) to Weminuche Creek in the Rio Grande River Basin (Division 3).

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable Oct. 1-12, 2008 before the well froze, and May 20, 2009 when diversion started to Jul. 7, 2009 when diversion was turned off. The diversion was also turned off late on Jun. 3, 2009 and back on during the afternoon of Jun. 18, 2009. During these 'no-flow' periods, the gage-height did not drop below 0.12 to 0.13 feet. It was assumed that a deposit of silt in the well prevented the shaft encoder float from dropping below that gage-height. There was no flow from Oct. 13, 2008 to May 19, 2009, Jun. 4-17, 2009 and from Jul. 8 to Sep. 30, 2009.

Datum Corrections.-- The flume is in good condition.

Rating.-- Rating PRWDITCO04, a standard 3 foot Parshall flume rating, was used all year. Changes in approach conditions above flume and deposition below flume cause minor shifting. There was no discharge measurements made this year. Since 2000, seven measurements have been made and the shifts varied from -0.03 to -0.07 ft. The last measurement was made on Jul. 10, 2008 and resulted in a shift of -0.05 feet. The peak flow of 9.48 cfs occurred at 12:45 on Jun. 26, 2009 at a gage height of 0.91 feet with a shift of -0.05 feet.

Discharge.-- The last measured shift (-0.05 feet) was distributed through the entire period of record. Discharge measurements indicate that this shift would be accurate through all ranges in stage encountered.

Special Computations.--

Remarks.-- Record is good. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS

RATING TABLE--

PRWDITCO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

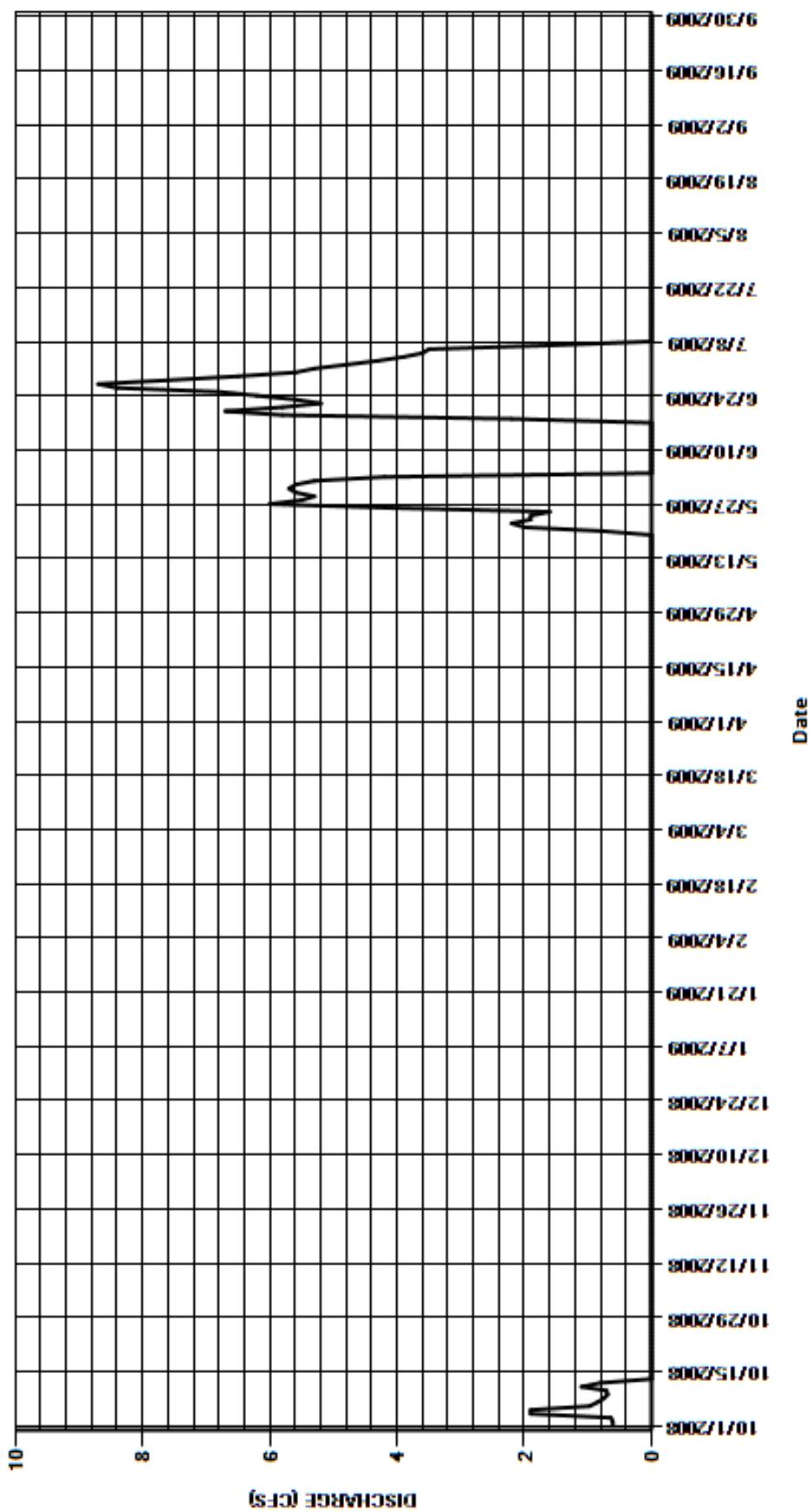
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.61	0	0	0	0	0	0	0	5.6	5.3	0	0
2	0.61	0	0	0	0	0	0	0	5.3	4.8	0	0
3	0.64	0	0	0	0	0	0	0	4.2	4.3	0	0
4	1.9	0	0	0	0	0	0	0	0	3.9	0	0
5	1.9	0	0	0	0	0	0	0	0	3.6	0	0
6	0.97	0	0	0	0	0	0	0	0	3.5	0	0
7	0.85	0	0	0	0	0	0	0	0	1.6	0	0
8	0.75	0	0	0	0	0	0	0	0	0	0	0
9	0.69	0	0	0	0	0	0	0	0	0	0	0
10	0.71	0	0	0	0	0	0	0	0	0	0	0
11	1.1	0	0	0	0	0	0	0	0	0	0	0
12	0.8	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	2.2	0	0	0
19	0	0	0	0	0	0	0	0	5.8	0	0	0
20	0	0	0	0	0	0	0	0.76	6.7	0	0	0
21	0	0	0	0	0	0	0	2	5.8	0	0	0
22	0	0	0	0	0	0	0	2.2	5.2	0	0	0
23	0	0	0	0	0	0	0	1.9	5.6	0	0	0
24	0	0	0	0	0	0	0	1.9	6.2	0	0	0
25	0	0	0	0	0	0	0	1.6	6.8	0	0	0
26	0	0	0	0	0	0	0	4.1	8.4	0	0	0
27	0	0	0	0	0	0	0	6	8.7	0	0	0
28	0	0	0	0	0	0	0	5.5	7.6	0	0	0
29	0	0	0	0	---	0	0	5.3	6.5	0	0	0
30	0	0	0	0	---	0	0	5.6	5.6	0	0	0
31	0	---	0	0	---	0	---	5.7	---	0	0	---
TOTAL	11.53	0.00	0.00	0.00	0.00	0.00	0.00	42.56	96.20	27.00	0.00	0.00
MEAN	0.37	0	0	0	0	0	0	1.37	3.21	0.87	0	0
AC-FT	23	0	0	0	0	0	0	84	191	54	0	0
MAX	1.9	0	0	0	0	0	0	6	8.7	5.3	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0
CAL YR	2008	TOTAL	166.67	MEAN	0.46	MAX	8.9	MIN	0	AC-FT	331	
WTR YR	2009	TOTAL	177.29	MEAN	0.49	MAX	8.7	MIN	0	AC-FT	352	

MAX DISCH: 9.5 CFS AT 12:45 ON Jun. 26,2009 GH 0.91 FT. SHIFT -0.05 FT.

MAX GH: 0.91 FT. AT 12:45 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09351000 PINER RIVER WEMINUACHE PASS DITCH AT WEMINUACHE PASS
WY2009 HYDROGRAPH



RIO GRANDE RIVER BASIN
09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS
Water Year 2009

Location.-- Weminuche Pass ditch diverts water from left bank of Rincon la Vaca Creek (tributary to Los Pinos River) in sec. 5, T.39 N., R.4 W., in San Juan River basin, to Weminuche Creek in sec. 33, T.40 N., R.4 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Electronic data logger with satellite transmitter, which records gage-height data from a float-operated shaft encoder in a CMP shelter and stilling well. One intake pipe attaches well to 5 foot Parshall flume.

Hydrographic Conditions.-- Weminuche Pass Ditch diverts water from left bank of Rincon la Vaca Creek (tributary to Los Pinos River) in San Juan River Basin (Division 7) to Weminuche Creek in Rio Grande River Basin (Division 3).

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable from May 28, 2009 when diversion started to Jul. 7, 2009 when flow ceased, except for Jun. 11-19, 21, 22, 2009 when something prevented float from dropping below 0.80 feet. There was also several days with bad data points received due to poor transmitted signal reception. Most of these points were not imported into the records spreadsheet because they were outside of the import limits. There was one bad imported point on three days, May 29, Jun. 2, and Jun. 4, 2009, which were corrected. There was no flow from Oct. 1, 2008 to May 27, 2009 and from Jul. 8 to Sep. 30, 2009.

Datum Corrections.-- The flume is in good condition.

Rating.-- Rating WEMDITCO05, a standard 5 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause minor shifting. There were no discharge measurements made this year. Since 1997, seven measurements have been made and the shifts varied from -0.01 to -0.03 ft. The last measurement was made on Jul. 10, 2008 and resulted in a shift of -0.02 feet. The peak flow of 18.8 cfs occurred at 17:30 on Jun. 10, 2009 at a gage-height of 0.98 feet with a shift of -0.02 feet.

Discharge.-- The last measured shift (-0.02 feet) was distributed through the entire period of record. Discharge measurements indicate that this shift would be accurate through all ranges in stage encountered except possibly for the extreme low stages of Jul. 3-7, 2009.

Special Computations.--

Remarks.-- Record is good, except for the periods of Jun. 11-19, 21, 22, 2009, which is considered poor due to uncertainty in the float action, and Jul. 3-7, 2009, which is rated fair due to uncertainty in shift at extreme low stages. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS

RATING TABLE--

WEMDITCO05 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	9.3	12	0	0
2	0	0	0	0	0	0	0	0	8.5	6.8	0	0
3	0	0	0	0	0	0	0	0	8.3	0.65	0	0
4	0	0	0	0	0	0	0	0	9.1	0.53	0	0
5	0	0	0	0	0	0	0	0	11	0.53	0	0
6	0	0	0	0	0	0	0	0	12	0.46	0	0
7	0	0	0	0	0	0	0	0	11	0.27	0	0
8	0	0	0	0	0	0	0	0	13	0	0	0
9	0	0	0	0	0	0	0	0	14	0	0	0
10	0	0	0	0	0	0	0	0	15	0	0	0
11	0	0	0	0	0	0	0	0	13	0	0	0
12	0	0	0	0	0	0	0	0	13	0	0	0
13	0	0	0	0	0	0	0	0	14	0	0	0
14	0	0	0	0	0	0	0	0	13	0	0	0
15	0	0	0	0	0	0	0	0	13	0	0	0
16	0	0	0	0	0	0	0	0	12	0	0	0
17	0	0	0	0	0	0	0	0	13	0	0	0
18	0	0	0	0	0	0	0	0	13	0	0	0
19	0	0	0	0	0	0	0	0	13	0	0	0
20	0	0	0	0	0	0	0	0	15	0	0	0
21	0	0	0	0	0	0	0	0	13	0	0	0
22	0	0	0	0	0	0	0	0	13	0	0	0
23	0	0	0	0	0	0	0	0	13	0	0	0
24	0	0	0	0	0	0	0	0	14	0	0	0
25	0	0	0	0	0	0	0	0	12	0	0	0
26	0	0	0	0	0	0	0	0	15	0	0	0
27	0	0	0	0	0	0	0	0	12	0	0	0
28	0	0	0	0	0	0	0	0	4.2	13	0	0
29	0	0	0	0	---	0	0	0	11	12	0	0
30	0	0	0	0	---	0	0	0	9.6	11	0	0
31	0	---	0	0	---	0	---	10	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.80	371.2	21.24	0.00	0.00
MEAN	0	0	0	0	0	0	0	1.12	12.4	0.69	0	0
AC-FT	0	0	0	0	0	0	0	69	736	42	0	0
MAX	0	0	0	0	0	0	0	11	15	12	0	0
MIN	0	0	0	0	0	0	0	0	8.3	0	0	0

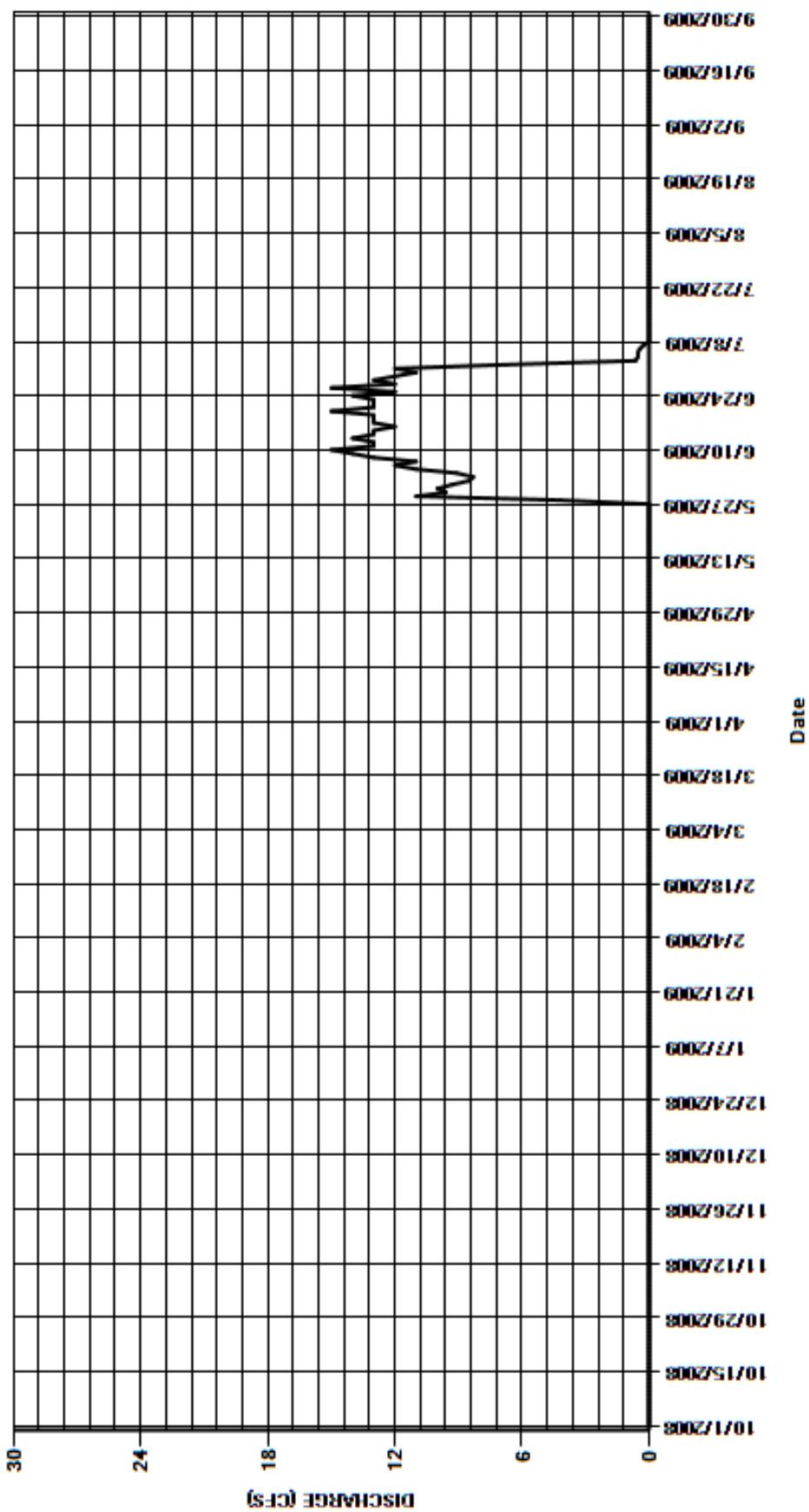
CAL YR	2008	TOTAL	374.84	MEAN	1.02	MAX	24	MIN	0	AC-FT	743
WTR YR	2009	TOTAL	427.24	MEAN	1.17	MAX	15	MIN	0	AC-FT	847

MAX DISCH: 19 CFS AT 17:30 ON Jun. 10,2009 GH 0.98 FT. SHIFT -0.02 FT.

MAX GH: 0.98 FT. AT 17:30 ON Jun. 10,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WY2009 HYDROGRAPH



GUNNISON RIVER BASIN
MUDDY CREEK ABOVE PAONIA RESERVOIR
Water Year 2009

Location.--	Lat. 38°59'15", Long. 107°20'53", in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec 28, T.12 S., R.89 W. in Gunnison County on the right bank 700 ft. downstream from county bridge and 1400 ft. upstream from high water line of Paonia Reservoir.
Drainage and Period of Record.--	
Equipment.--	Graphic water-stage recorder (Stevens A35) and a Sutron 8210 High Data Rate DCP in a 42-inch CMP shelter and well. The graphic recorder and shaft encoder operate from separate floats and are set to an adjustable reference point attached to the instrument shelf. The primary reference gage is a steel drop tape. A Sutron Accububble is an auxiliary / backup. The gage, also, has an air temperature sensor. The A/B was replaced with a Constant Flow Bubbler on May 20, 2009. No other changes.
Hydrographic Conditions.--	The basin is composed of conifer and aspen forest to open sagebrush hillsides. There is some limited irrigation diversion for mountain grass hay up stream. A very large land slide continues to encroach from the east about four miles upstream. This process is more active in the spring and during high ground water conditions.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data down loaded from the transmitted satellite data. Missing satellite data were filled in with data downloaded from the DCP. Data from the bubbler gage was used periodically when the floats were disengaged during oil cylinder activity. There were two primary sensor calibrations and six flush corrections this year. The SE corrections were -0.03 ft. at 1542 hrs. on 12/15/09 and +0.01 ft at 1123 hrs. on 4/14/09. The flush corrections were +0.04 ft. at 1000 hrs. on 4/14/09 (this ran concurrently with a SE Corr., therefore it was hand edited to the previous inflection); +0.04 ft at 1100 hrs. on 5/8/09; +0.08 ft at 1400 hrs. on 5/20/09; +0.02 ft at 1300 hrs. on 7/6/09; +0.03 ft. at 1800 hrs on 7/13/09 and +0.02 ft at 0900 hrs. on 8/27/09. The record is complete and reliable, except for periods when the stage-discharge relationship was affected by ice: Nov 25-27 and Dec 10, 2008 to Feb 7, 2009.
Datum Corrections.--	Levels were not run this year. Levels were last run on August 28, 2007.
Rating.--	The stream bed is composed of medium to large sized cobble. During spring runoff the channel is fairly stable at the gage site. There is an encroaching shelf of cobble moving downstream from above. The left bank is flat at the gage and then pinches into a steep cliff about 50 feet downstream. The right bank is flat brush and mixed conifer. Sheet flow occurs on the right bank during high water. When this happens, water has been a foot deep at the gage house. During low flows in the range of 10 to 20 cfs an irregular medium cobble riffle is a section control about 10 to 20 feet below. During medium flows the channel is the control. During high flows the channel is the control with some influence by the brush on the right side and the constriction by the cliff on the left side. During extremely high flows the brush on the right, the cliff on the left and possibly a large boulder on the left all have greater influence on the channel control. The heavy sediment load settles out when the velocities drop and are deposited on the stream bed. The slope at and below the gage doesn't allow the sediment to completely bury the cobble, but it does significantly smooth the cobble character of the stream bed. Rating MUDAPRCO8B was developed and used the entire water year. It incorporated the highest measurement made last year and recent measurements. There were 10 measurements (362 – 371) made this year. They cover the range in stage from 5.25 to 7.44 ft. These compare to the range of recorded stage from a low of 5.09 to a high of 7.95 ft. The instantaneous peak flow was 1350 cfs at 2300 May 7, 2009 (gage height 7.95 ft., shift +0.07 ft.) and exceeded the stage of measurement No. 369 made May 8, 2009 by 0.51 ft. There were 29 days when the mean daily discharge was below the lowest measured flow of 23.1 cfs. These were Dec 27 and 29, 2008; Jan 1, 5, 10, 18; Aug 13, 17-28 and Sep 1, 12, 13, 23, 26-30, 2009. There were nine days when the mean daily discharge exceeded the highest measured discharge of 931 cfs. These were Apr 23-25; May 1, 7-10 and 12, 2009.
Discharge.--	Shifts were prorated by time from the beginning of Water Year 2009 at 0000 hours on Oct 1, 2008 to the highest measurement, No 369 at 1400 hrs. on 5/8/09. Then there was a single variable shift table employed throughout the rest of the year, MUDAPR09_VS1, applied from 1500 hrs. on 5/8/09 to 2345 hrs. on 9/30/09. All of the measured shifts were given full weight except the ice measurements 364 and 365, which were discounted totally, and No 363 and 368 which were adjusted to smooth shift distribution. They were discounted from -5% to +4%. Open water measurements had shifts from -0.04 to +0.07.
Special Computations.--	The ice affected period was estimated using partial day record, adjacent good days, temperatures from the temperature sensor located at this site, the graphic chart record and two measurements. A hydrograph was used. The change from Rating No 7 to Rating No 8B resulted in a disconnect of 0.30 cfs or about +1% for the last hour of last year and the first hour of this year. The last years shift value was adjusted using the new rating table which resulted in the disconnect. The DMS was not changed for No 361 because it was set with last year's record.
Remarks.--	The record is good, except for the periods when the stage-discharge relationship was affected by ice, which were estimated and are considered poor. Station maintained and operated by Gerald M. Thrush and Stephen W. Tuck and record developed by Gerald M. Thrush.
Recommendations.--	None.

STATE OF COLORADO
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OFFICE OF STATE ENGINEER

MUDDY CREEK ABOVE PAONIA RESERVOIR

RATING TABLE--

MUDAPR008B USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

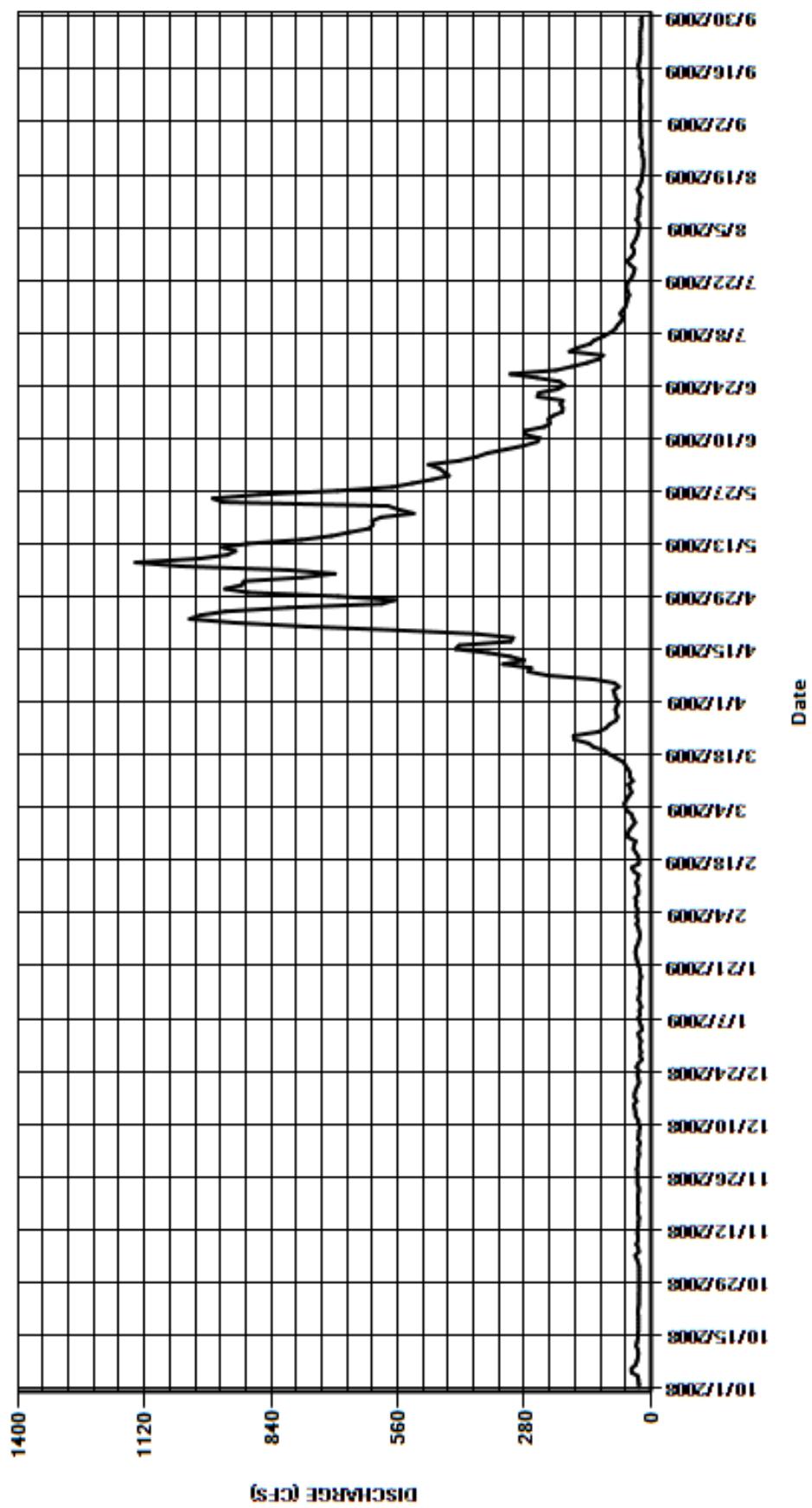
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	26	28	e22	e32	40	71	942	458	115	38	23
2	27	26	26	e26	e28	42	78	905	469	106	33	24
3	28	28	28	e28	e32	52	80	900	492	180	30	24
4	29	31	27	e20	e30	57	83	772	423	162	28	24
5	43	35	24	e22	e30	59	71	699	386	135	26	24
6	43	27	29	e25	e34	54	81	803	362	125	27	23
7	34	28	27	e28	e32	49	128	1040	321	105	32	24
8	31	32	27	e24	35	43	229	1140	281	90	27	25
9	29	29	24	e26	28	46	271	1000	252	79	27	24
10	28	29	e28	e22	28	50	265	937	246	74	27	24
11	29	30	e28	e24	30	40	327	919	280	66	26	24
12	33	29	e34	e28	33	46	280	947	277	61	24	23
13	31	28	e34	e26	29	46	311	891	236	68	22	22
14	29	28	e36	e24	27	50	360	774	223	62	26	26
15	29	26	e38	e26	38	56	432	707	227	56	30	25
16	28	29	e32	e24	43	61	424	667	216	54	25	27
17	28	29	e36	e24	27	76	310	623	196	52	22	28
18	28	29	e36	e22	27	91	305	615	195	48	20	26
19	28	28	e34	e24	28	102	384	617	200	52	19	25
20	28	29	e30	e24	34	127	560	597	195	54	18	23
21	29	29	e26	e28	39	138	763	525	251	53	17	23
22	28	27	e28	e30	37	170	920	557	248	46	17	23
23	27	27	e30	e32	34	171	1020	582	207	41	17	23
24	27	30	e26	e34	50	117	996	947	191	38	19	23
25	27	e30	e32	e34	51	100	940	969	202	36	19	24
26	27	e30	e28	e32	48	92	802	866	252	46	23	23
27	26	e30	e20	e28	41	78	595	694	311	53	21	22
28	26	31	e24	e26	35	74	567	572	210	44	20	21
29	26	29	e22	e24	---	77	692	528	175	38	23	22
30	26	29	e24	e26	---	79	891	484	141	38	23	20
31	26	---	e24	e28	---	75	---	447	---	43	24	---
TOTAL	905	868	890	811	960	2358	13236	23666	8123	2220	750	712
MEAN	29.2	28.9	28.7	26.2	34.3	76.1	441	763	271	71.6	24.2	23.7
AC-FT	1800	1720	1770	1610	1900	4680	26250	46940	16110	4400	1490	1410
MAX	43	35	38	34	51	171	1020	1140	492	180	38	28
MIN	26	26	20	20	27	40	71	447	141	36	17	20
CAL YR	2008	TOTAL	76770	MEAN	210	MAX	2240	MIN	20	AC-FT	152300	
WTR YR	2009	TOTAL	55499	MEAN	152	MAX	1140	MIN	17	AC-FT	110100	

MAX DISCH: 1350 CFS AT 23:00 ON May.07,2009 GH 7.95 FT. SHIFT 0.07 FT.

MAX GH: 7.95 FT. AT 23:00 ON May.07,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MUDY CREEK ABOVE PAONIA RESERVOIR
WY2009 HYDROGRAPH



GUNNISON RIVER BASIN
MUDDY CREEK BELOW PAONIA RESERVOIR
Water Year 2009

Location.--	Lat. 38°56'26", Long. 107°21'24" in the SE 1/4 NW 1/4 NE 1/4 sec. 8, T.13 S., R. 89 W. (in Gunnison County on the right hand bank), and about 100 feet above county bridge and about 1100 feet below Paonia Reservoir outlet.
Drainage and Period of Record.--	
Equipment.--	Shaft encoder, Sutron SatLink DCP and Graphic Chart Recorder (Stevens A 35) in a culvert type shelter and well. The recorder and shaft encoder are on separate floats and set to an inside drop tape. The DCP is in an outside NEMA box. No changes were made this year.
Hydrographic Conditions.--	The control is a concrete ramp flume. Flows are completely controlled by Paonia Reservoir until the reservoir spills.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with the electronic data from the Sutron SatLink Electronic Data Logger and chart record used for backup purposes. There were three shaft encoder corrections, and no corrections from cleaning moss and no flush corrections. The SE corrections were as follows: +0.01 ft at 1610 hrs on 11/14/08; -0.02 ft at 1320 on 3/25/09 and +0.01 ft at 1346 on 4/4/09. The record is complete and reliable. Missing satellite data on a few days were filled in with Electronic Data Logger values, and some hours, which were less than 16 unit values (four hours), were edited and verified from the chart without loss of accuracy.
Datum Corrections.--	No levels were run this water year. Levels were last run at this station on August 28, 2007.
Rating.--	The rating table MUDBPRCO09A was used for all of WY 2009. During higher flows approaching 800 cfs the banks neck down and the county road bridge piers act as a compound control. There were 10 measurements during WY 2009 (No. 344 to No. 353). Measurements ranged from 4.37 cfs to 1090 cfs. They cover the range in stage experienced except for days when average daily flows were lower than 4.37 cfs, Feb 11-18; Apr 11 – 13 and May 15 – 2218, 2009. There was one day when the average daily flow was higher than 1090 cfs, Apr 21, 2009. The peak discharge for the year of 1130 cfs (gage height of 6.46 ft. shift of +0.15 ft) occurred 2015 April 20, 2009 and exceeded the maximum measured discharge and gage height by 40 cfs and 0.06 ft., respectively (Meas. 351 on May 8, 2009).
Discharge.--	Shifts were distributed by time from 1800 on Oct 24, 2008 to 1400 on Feb 18, 2009 and from 0900 on Sep 23, 2009 to 2345 on Sep 30, 2009. During the rest of the year three Variable Shift tables were used. MUDBPRCO09VS1 (applied from 0000 on Oct 1, to 1700 on Oct 24, 2008); MUDBPRCO08VS2 (applied from 1500 on Feb 18 to 2000 on May 8, 2009) and MUDBPRCO08VS3 (applied from 2100 on May 8 to 0800 on Sep 23, 2009). , The range of raw shifts seen for rating No. 9A was from 0.00 to +0.15. All measurements were given full weight except measurements 345, 346, 347, 349 and 352 which were discounted from (-)6% to (+)8% for shift value smoothing.
Special Computations.--	There was an observation of drawdown in the stilling well. Reference readings taken on May 8, 2009 indicate the outside cantilever gage read 0.10 feet higher than the drop tape readings taken inside the gage house. The wave action and turbulent conditions associated with the high flows at this gage appear to cause a drawdown affect inside the stilling well. The measured shifts at the higher flows absorb and offset the drawdown affect in the well. The high flow measurement made this water year (Meas. No. 351) had a shift of +0.15 feet. Draw down has been seen during high flows before the ramp flume was installed. The upper end of the rating needs to be calibrated to these new readings.
Remarks.--	The record is good. Station operated and maintained by Stephen Tuck and Jerry Thrush. Record developed by Jerry Thrush.
Recommendations.--	The Water Commissioners and Dam Tender checking this station should be encouraged to sign and date the chart when they make an inspection. The rating needs to be reviewed and revised especially on the upper end. Levels should be run in Water Year 2010

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MUDDY CREEK BELOW PAONIA RESERVOIR

RATING TABLE--

MUDBPRCO09A USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

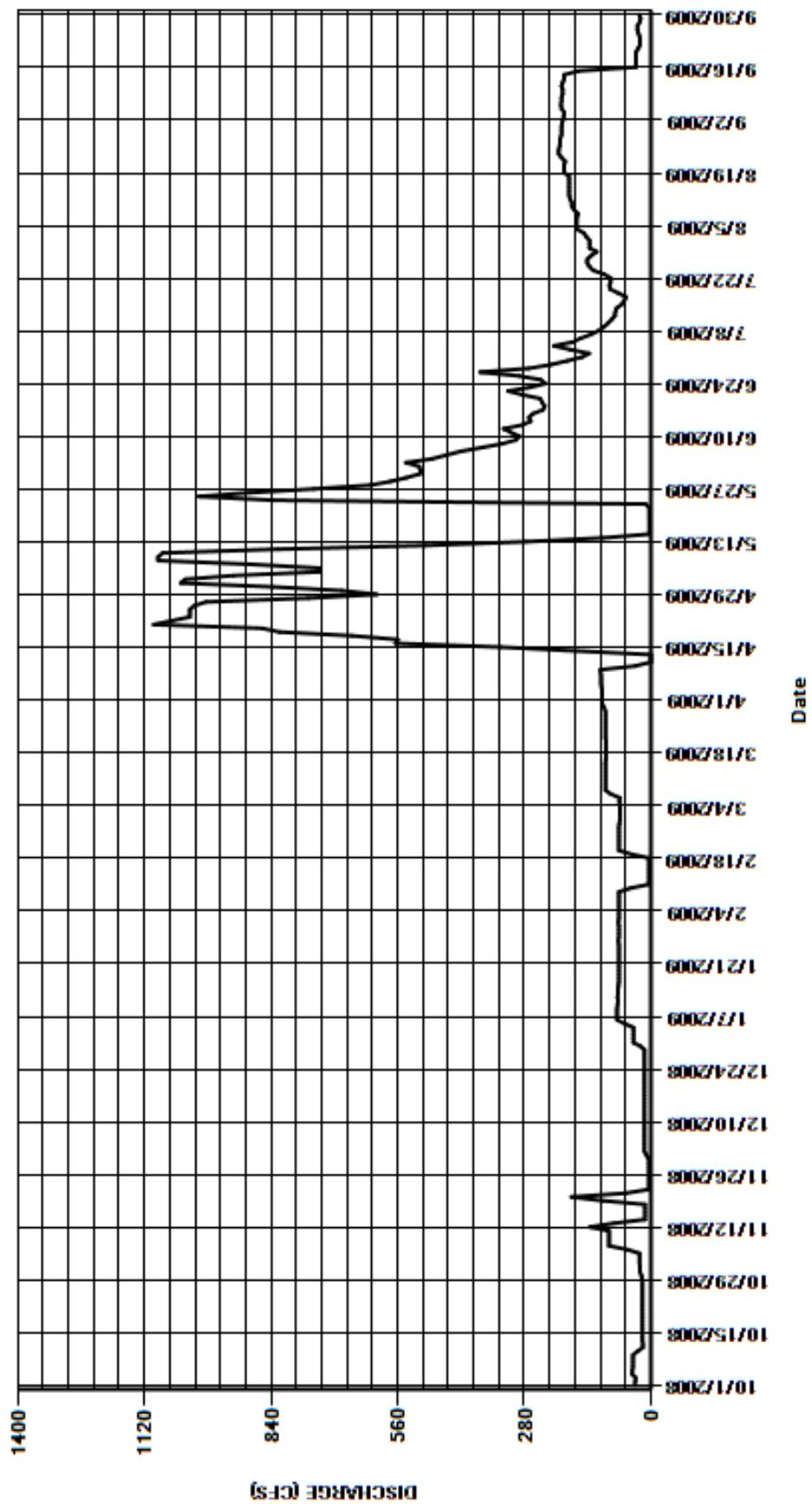
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	24	9.5	39	72	69	108	837	510	153	136	197
2	35	25	14	39	71	69	108	1040	513	137	143	195
3	34	25	14	39	71	69	108	1030	542	179	149	193
4	42	25	14	39	71	69	109	924	484	215	164	192
5	41	25	14	58	71	70	110	734	452	173	164	198
6	40	52	14	75	71	69	110	734	420	156	164	199
7	40	93	14	75	71	89	110	885	374	133	164	198
8	40	93	14	75	71	101	111	1090	329	116	161	198
9	40	93	14	75	71	101	112	1090	299	105	169	195
10	30	93	14	74	45	101	34	1080	291	95	175	195
11	18	93	14	73	4.2	101	0	826	310	87	175	198
12	18	135	14	74	4.2	101	0	498	326	80	179	195
13	19	82	14	73	4.2	101	0	276	284	79	181	192
14	19	13	14	73	4.2	101	167	106	266	76	181	192
15	19	13	14	72	4.2	101	333	3.2	270	65	181	161
16	19	13	14	71	4.2	100	565	3.2	261	59	181	33
17	19	13	14	71	4.2	99	560	3.2	239	55	181	33
18	19	13	14	71	4.2	99	661	3.3	235	72	181	33
19	19	106	14	71	43	99	821	3.7	241	90	192	33
20	19	176	14	71	71	99	860	3.7	245	92	192	33
21	19	56	14	71	71	99	1100	3.7	284	89	192	28
22	19	4.7	14	71	71	101	1060	3.7	316	89	190	24
23	19	4.7	14	71	71	101	1020	12	267	103	198	24
24	19	4.7	14	71	71	101	1020	834	234	127	204	25
25	19	4.7	14	71	71	101	1020	1000	244	136	204	28
26	19	4.7	14	71	71	101	1010	888	291	141	202	30
27	19	4.7	14	72	70	101	984	746	378	141	201	30
28	19	4.7	14	71	69	101	758	621	271	132	201	25
29	19	4.7	14	71	---	101	607	576	222	120	198	23
30	21	4.7	23	71	---	104	684	541	186	136	198	26
31	24	---	39	71	---	108	---	511	---	136	198	---
TOTAL	781	1303.3	463.5	2090	1397.6	2927	14250.00	16906.7	9584	3567	5599	3326
MEAN	25.2	43.4	15	67.4	49.9	94.4	475	545	319	115	181	111
AC-FT	1550	2590	919	4150	2770	5810	28260	33530	19010	7080	11110	6600
MAX	42	176	39	75	72	108	1100	1090	542	215	204	199
MIN	18	4.7	9.5	39	4.2	69	0	3.2	186	55	136	23
CAL YR	2008	TOTAL	84926.8	MEAN	232	MAX	1140	MIN	4.7	AC-FT	168500	
WTR YR	2009	TOTAL	62195.10	MEAN	170	MAX	1100	MIN	0	AC-FT	123400	

MAX DISCH: 1130 CFS AT 20:15 ON Apr. 20,2009 GH 6.46 FT. SHIFT 0.15 FT.

MAX GH: 6.46 FT. AT 20:15 ON Apr. 20,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MUDY CREEK BELOW PAONIA RESERVOIR
WY2009 HYDROGRAPH



GUNNISON RIVER BASIN

ABC LATERAL

Water Year 2009

Location.--	Lat. 38°29'06", Long. 107°44'57", in SE 1/4 NE 1/4 NE 1/4 sec. 27, T.49 N., R.8 W., Montrose County, on left bank of canal 270 ft. below takeout from South Canal, such takeout being 1700 ft. below the west portal of the Gunnison Tunnel.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Satlink 2 HDR data collection platform with shaft encoder and strip chart recorder (Stevens A35) in a 36 in. diameter CMP shelter and a 24 in CMP stilling well. The recorder and shaft encoder operate from separate floats and are set to an inside drop tape referenced to an adjustable RP on the instrument shelf. The control is a broad crested concrete structure about 12-feet below the gage. A wooden bridge at the gage is used to make flow measurements.
Hydrographic Conditions.--	The AB and C Drop aka the AB Lateral Canal is part of the Gunnison Tunnel complex. The South Canal is the other part. The two structures are combined to account for the total diversion through the Gunnison Tunnel. Generally there is very little ice effect due to the warm thermal properties of the water. At times snow will blow onto the control and this probably has some effect, but this is barely distinguishable on the chart and has been ignored. The AB Lateral is a man made structure. The control is a concrete broad crested weir. that is 100% controlled. Two gates are set located below the control. One gate is used to deliver water to Cedar Creek while the other controls the flows on the AB Lateral. At times both gates can be operated in such a way that causes the control to become 100% submerged. Heavy moss growth on the control causes variability in the stage-discharge relationship. Varying degrees of backwater with up to 100% submergence.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder downloaded from satellite data with chart record and DCP log as backup. Record is complete and reliable, except for three periods when the control was submerged. The control was submerged on February 17-18, 2009; March 2 and 6-30; April 14-30; May 1, 2009 when the gates downstream were closed and caused the water to backup into the control. The gage was visited on 28 separate occasions to verify the instruments remained calibrated to the primary reference. The shaft encoder was adjusted on 3 separate occasions (Oct. 31, 2008, Feb. 3, 2009 and Apr. 30, 2009). The corrections ranged in magnitude of +0.02 to -0.02 ft. Moss was removed from the control causing corrections to the gage height record. The operating period of the canal was from Oct. 01, 2008 to Oct. 30, 2008 and from March 25, 2009 through Sep. 30, 2009. The intervening winter period, consisted of seepage from the Gunnison Tunnel. This winter shut down period is a normal operational occurrence. This year there were nine occurrences of increased flow during winter shutdown period. These were periods when the Gunnison Tunnel was turned on to fill Fairview Reservoir and the AB Lateral head gate was left open.
Datum Corrections.--	Levels were last run on Aug. 15, 2006 using bench mark No. 1 (BM#1) as the base. No corrections were made as the RP and drop tape were found to be within the allowable tolerances.
Rating.--	The channel is concrete lined above and below the control section. The left side is a smooth trapezoidal shape. The right side is a smooth trapezoidal shape with a square step at the bottom. The concrete has been repaired in places and this has broken off in places. The condition is decomposed concrete to smooth. The control is a broad crested concrete structure about 12 ft. below the shelter in stilling well intakes. During certain periods of operation the gate/flume over Cedar Creek and the gate for the Cedar Creek drop, approximately 200 ft downstream, act as a compound or two-stage control. Rating ABCLATCO01 in use since the gage was installed was used through until 2359 on October 31, 2008. Rating ABCLATCO02Bb began on 0000 November 1, 2008 and was used for the rest of the Water Year. The rating is well defined to 230 cfs. It has better definition at the low flows and appears to be good through the range of flows seen. The moss growth during the later part of the year is the cause for negative shifts. Fifteen discharge measurements (Nos. 294-308) were made this year. Measured flows ranged in discharge from 0.56 cfs to 125 cfs. Observations of zero flow were made at 1655 hours on 3/11/09 and at 1555 hours on 3/18/09. These measurements and observations cover the range in stage experienced., except for the higher daily flows on July 9-17, 2009. The peak instantaneous flow at 1515 July 08, 2009 (126 cfs, GH = 3.13 ft, shift = +0.01 ft) exceeded the stage of measurement No. 306, made July 9, 2009 by 0.01 ft. This same measurement was the max discharge measurement and the instantaneous flow exceeded it by 3 cfs.
Discharge.--	Shifting control method was used during all periods of record. Shifts were prorated by time from 0000 Oct 01, 2008 to 1700 on Oct 16 , 2008; and from 1600 Oct 31, 2008 to 1000 0800 Apr 14, 2009 and from 1100 May 1 2009 to the end of water year. During the remainder of the water year two variable stage-shift relationships were applied: ABCLAT09VS1 (applied from 1800 October 16, 2008 to 1500 October 31, 2008) was used to define the period at the end of the irrigation season when the lateral was turned down for winter operations (between measurement No. 294 and 295), and ABCLAT09VS2 (applied from 0900 April 14, 2009 to 1000 May 01, 2009) was used to estimate flows while the control was operating under submerged conditions. Measurements showed shifts varying between -0.26 and +0.06 feet. All were given full weight except Nos. 294, 296, 297, 301, 303, 305, 307 and 308, which were discounted from -5% to +4% to smooth shift distribution.
Special Computations.--	Estimated flows during periods of backwater effect were calculated from adjacent days before and afterwards using the base winter flows. Estimates for operational flows employed partial days and observations of partial days and the following measurement.
Remarks.--	The record is good, except for periods when the flow was estimated due to back water. February 17-18, 2009 should be rated as fair since a measurement was made during this period with fairly stable gage heights. March 2 and 6-30; April 14-30; May 1, 2009 should be rated as poor record. Gage operated and maintained and record developed by Gerald M. Thrush.
Recommendations.--	

A flush riser needs to be installed. The riser will need to placed at an angle outside the gage shelter in order to miss the measurement bridge.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ABC LATERAL

RATING TABLE--

ABCLATCO01 USED FROM 01-Oct-2008 TO 31-Oct-2008
ABCLATCO02 USED FROM 01-Nov-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	112	0.5	1.1	1.2	0.93	0.6	4.4	54	87	96	123	119
2	111	0.55	1.1	1.2	0.93	e3.3	4.4	69	87	96	123	119
3	110	0.6	1.1	1.3	10	3.2	4.4	71	87	96	123	119
4	109	0.92	1.1	1.4	13	0.75	4.4	71	87	96	123	118
5	109	0.64	1.1	1.4	0.62	0.7	4.3	71	87	96	123	118
6	109	0.35	1.1	29	0.6	e0	4.5	71	88	96	123	118
7	109	0.35	1.1	17	0.6	e0	4.4	72	88	96	123	118
8	109	0.51	1.1	0.61	0.6	e0	4.4	72	88	110	123	118
9	109	0.88	18	0.54	0.6	e0	4.4	72	88	125	122	116
10	109	1.4	22	0.57	0.6	e0	4.5	72	89	125	122	116
11	109	9.4	0.93	0.75	0.6	e0	4.6	72	89	125	122	117
12	108	7.8	0.97	0.86	0.6	e0	4.6	82	89	124	122	117
13	108	2.9	1	1	0.6	e0	4.6	84	89	124	122	117
14	106	2.6	1	1.2	0.6	e0	7.3	78	89	124	122	117
15	100	1.1	1	1.3	0.6	e0	8.6	77	90	124	122	117
16	95	1.1	1	1.3	0.6	e0	8.6	77	92	124	121	117
17	95	1.1	1.1	1.3	e14	e0	8.4	78	92	124	121	117
18	96	1.1	1.1	1.2	e16	e0	8.2	79	92	123	121	117
19	96	1.1	1.2	1.2	0.73	e0	8.2	79	92	123	121	117
20	96	1.1	1.2	11	0.7	e0	8.2	78	92	123	121	117
21	96	1.1	1.2	11	0.7	e0	8.2	78	93	123	120	117
22	97	1.1	14	1	0.65	e0	15	84	93	123	120	118
23	96	1.1	14	1.1	0.58	e0	19	85	93	123	120	116
24	95	1	0.99	1.2	0.6	e0	23	85	94	123	120	114
25	94	13	0.98	1.3	0.6	e2.2	23	86	95	123	120	114
26	95	12	1.1	1.1	0.56	e4.1	23	86	95	123	119	115
27	96	1.1	1.1	1	0.6	e4.1	23	86	95	123	119	115
28	96	1	1.1	1.1	0.6	e4.1	29	86	95	123	119	115
29	96	1	1.1	1.1	---	e4.1	40	86	95	123	119	115
30	44	1.1	1.1	0.98	---	e4.2	41	87	96	123	119	115
31	0.6	---	1.1	0.93	---	4.4	---	87	---	123	119	---
TOTAL	3010.60	69.50	97.07	97.14	68.40	35.75	359.6	2415	2726	3623	3757	3503
MEAN	97.1	2.32	3.13	3.13	2.44	1.15	12	77.9	90.9	117	121	117
AC-FT	5970	138	193	193	136	71	713	4790	5410	7190	7450	6950
MAX	112	13	22	29	16	4.4	41	87	96	125	123	119
MIN	0.6	0.35	0.93	0.54	0.56	0	4.3	54	87	96	119	114

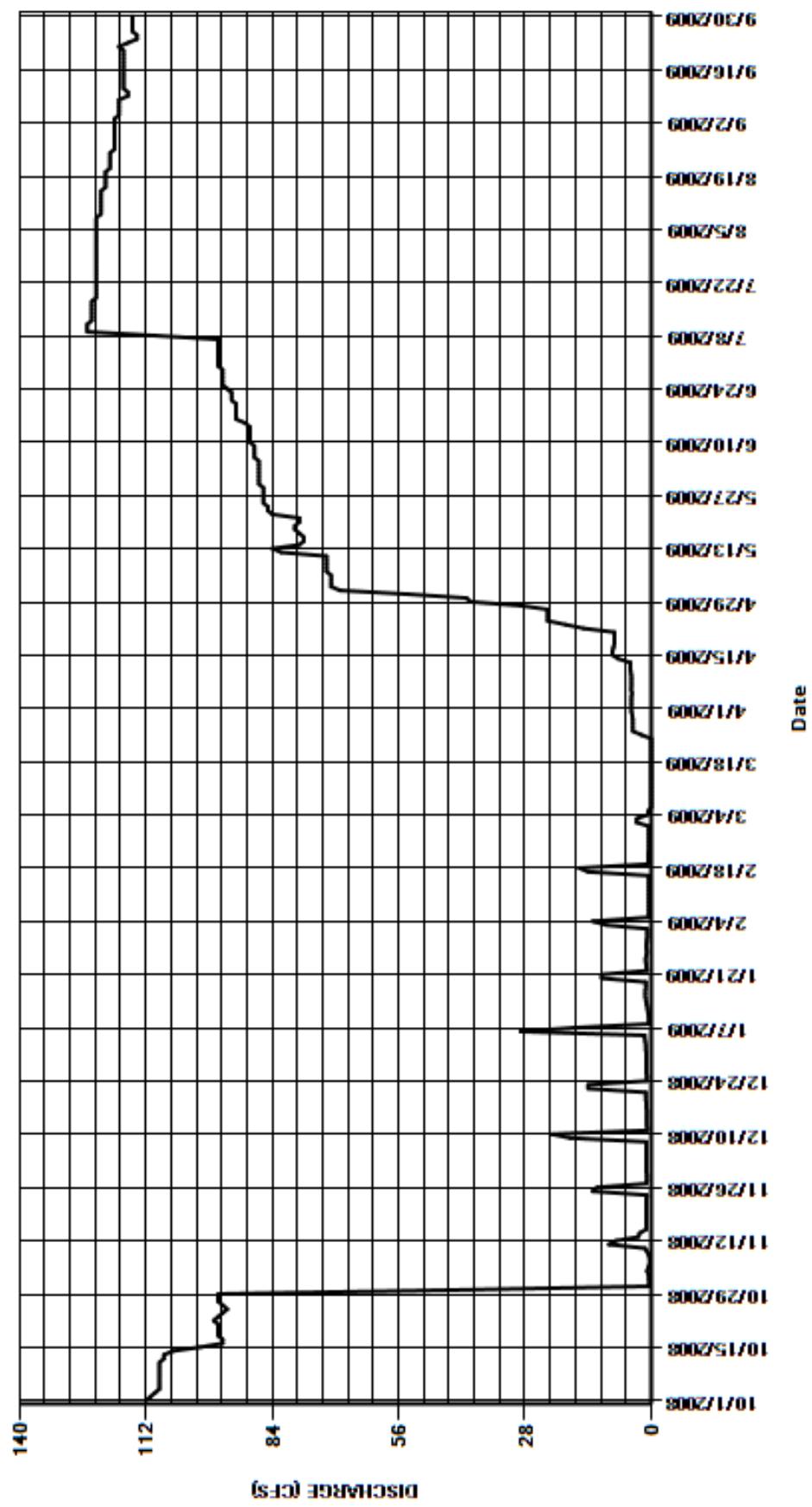
CAL YR	2008	TOTAL	18940.98	MEAN	51.8	MAX	127	MIN	0.35	AC-FT	37570
WTR YR	2009	TOTAL	19762.06	MEAN	54.1	MAX	125	MIN	0	AC-FT	39200

MAX DISCH: 126 CFS AT 15:15 ON Jul. 08,2009 GH 3.13 FT. SHIFT 0.01 FT.

MAX GH: 4.63 FT. AT 10:45 ON Mar. 25,2009 (backwater)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ABC LATERAL
WY2009 HYDROGRAPH



GUNNISON RIVER BASIN
SOUTH CANAL NEAR MONTROSE
Water Year 2009

Location.--	Lat. 38°29'01", Long. 107°45'20", in NE $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec 27, T.49 N., R.8 W., Montrose County, on right bank of canal approximately 3600 ft. below the west portal of the Gunnison Tunnel.
Drainage and Period of Record.--	N/A.
Equipment.--	Graphic water-stage recorder, Sutron Stage Discharge Recorder (SDR) and a Sutron Satlink Logger 2 DCP in a 42-inch diameter CMP shelter and well. The primary reference is a steel drop tape referenced to an adjustable brass nut mounted on the wood instrument shelf. The recorder and SDR operate from separate floats.
Hydrographic Conditions.--	A manmade structure which is a 100% controlled diversion. Winter and spring the natural gravel bar and two step concrete drop structure act as the main control for the gage. As late spring into summer and fall the willow /salt cedar and moss growth within the channel drown out the control. Large negative shifts occur as a result of the vegetative growth.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart and DCP download data as backup. The record is complete and reliable. There are periods, just after the fall shut down and after the 9 winter runs when there is a small amount of water observed below the level of the inlets. These trailing off values are below the 5% threshold of the total mean winter values and have been ignored as minuscule bank storage. There were four SDR corrections made: 11/12/08 +0.01 ft, 12/10/08 +0.01 ft, 2/18/09 -0.01 ft, and 3/19/09 +0.01 ft.
Datum Corrections.--	Levels were not run this water year. Levels were last run on Aug. 15, 2006, using BM No.1 as a base. BM 1, 2 and 3 were adjusted by -0.33 ft. due to the difference in the assumed RP elevation (21.00 ft.) and the actual tape length (20.67). The RP elevation was set to the tape length. BM #2 was found to be reading 0.03 ft. high and was adjusted to an elevation of 11.504 ft. No corrections were made to gage heights of measurements or charts
Rating.--	Control is a transition above a two step concrete drop structure. The low water control is natural gravel bar about 100 feet below the gage. Intermediate and high water control is the concrete transition structure located approximately 4,000 feet below the gage. Rating No. 16A in use since October 1, 2006, was used October 1, 2008 until October 31, 2008. Rating No. 16b dated November 1, 2008 was developed and implemented to help better define the mid and higher mid range conditions. The rating was used November 1, 2008 until the end of the water year. Fourteen discharge measurements (Nos. 374 - 387) were made during the water year ranging in discharge from 87.9 to 1030 cfs. Observation of zero flow was made on January 12, 2008. Measurements and observations of zero flow cover the range in flow experienced. The peak flow seen on July 09, 2009 at 0300 hrs (978 cfs, g.h.= 3.27 ft, shift = -0.14 ft) did not exceed the maximum flow of measurement No. 384, made July 08, 2009. The highest recorded stage (3.68 ft. at 0315 on Sep. 21, 2009) exceeded the highest measured stage of measurement No. 386, made on September 9, 2009 by 0.04 ft. in stage.
Discharge.--	Shifting control method was used during all periods of record. Shifts were distributed by 4 variable stage-shift relationships. SOUCAN09VS1 (applied from 0000 October 1, 2008 to 2345 October 31, 2008); SOUCAN09VS2 (applied from 0000 November 1, 2008 to 1200 January 5, 2009); SOUCAN09VS3 (applied from 1300 January 5, 2009 to 0800 September 23, 2009); SOUCAN09VS4 (applied from 0900 September 23, 2009 to 2345 September 30, 2009). Ten winter tunnel runs were made this water year. Eight runs were made between Meas. No. 375 and 376. At the beginning of the water releases on Dec. 9, Dec. 22, 2008 and Jan. 6, 2009 spikes in the gage height record were observed. The spikes were assumed to be formed by the initial surge of water flushing ice from the channel and lodging it on the control. The continuous flow of warmer water released from Crystal Reservoir melts and flushes the ice from the control along with the gravel that controls the stage-discharge relationship at low flows. The three spikes seen on winter tunnel runs were used to distribute shift values from -0.03 to +0.03 (# 375 to #376). Shift transitions were divided equally concerning the 0.06 ft. of shift difference between (-)0.03 and (+)0.03 ft. The first two were hand edited during the tunnel runs with *VS2 operating in between, and up to the day before the third consecutive (next in line) tunnel run with the final (third) spike when *VS3 went into operation. *VS3 contained the third increment of the distribution so no hand editing was necessary for it or the subsequent tunnel runs. Measurements show shifts varying from -0.93 to +0.14. All were given full weight and applied directly except for measurement numbers 381, 382, 383, 384, 385 and 387 which were discounted from -3% to + 2% to smooth shift distribution.
Special Computations.--	The calculated value for the shift adjustment for No. 384 was performed because it sets at the general intersection of a straight line projection from previous measurements and the next two measurements and there were no gate changes between it and the next two measurements. The growth of moss caused the rise in stage with no evidence of any more water being present after no. 384. No. 386 used a Rio Grand Workhorse which closely confirms the value seen on no. 385, and these confirm that the value measured in no.384 is more consistent with the two following measurements. This defends adjusting the highest measurement. The largest value (2 cfs) estimated during the trail off flows seen at shut downs is less than 2 % of the total run. The convention used by loss studies associated with the Arkansas River Compact of breaking off releases / deliveries at 5% or even 8% is a supporting argument for this decision.
Remarks.--	The record is good. Station maintained and record developed by Jerry Thush.
Recommendations.--	

The enormity of the gage pool makes the moss growth compound the negative shifts which are seen. The condition of a very large gage pool and a virtual channel control even without the aquatic growth makes the gage height much less sensitive to changes in the flow regimen. It is impractical to make any more frequent measurements, and even if it were there are instances when a particular stage or step / gate change isn't measured before another or next gate change takes place. We can only assume that the relationship between measurements is linear with a V Shift or when prorating by time.

Brian Boughton of Durango has suggested using an ADVM upstream. The site is concrete lined, is fairly close to the exit of the West Portal of the Gunnison Tunnel, has fairly high velocities which would minimize moss accumulation. The expense for the equipment and to relocate the gage would be high. The new site would need a bank operated cableway to use for conventional and ADCP measurements. The development of a velocity index rating would take time and that would be an additional investment. The benefits, however, would be far reaching. The time spent on frequent measurements to account for moss growth could be directed to other gages and projects. Confidence in the flow through the Gunnison Tunnel would be tremendously improved. The gage at the AB Lateral would still have to be operated.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CANAL NEAR MONTROSE

RATING TABLE--

SOUCANCO16A USED FROM 01-Oct-2008 TO 31-Oct-2008
SOUCANCO16b USED FROM 01-Nov-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	832	0	0	0	0	0	455	823	843	921	966	958
2	829	0	0	0	0	62	455	842	847	919	966	958
3	827	0	0	0	55	55	456	836	852	921	966	958
4	825	0	0	0	62	0	455	835	853	922	966	958
5	823	0	0	0	0	0	455	834	857	925	966	958
6	821	0	0	63	0	0	540	832	861	926	966	958
7	820	0	0	75	0	0	592	837	862	925	966	958
8	818	0	0	0	0	0	594	843	862	957	965	958
9	815	0	45	0	0	0	592	842	859	975	963	958
10	815	0	54	0	0	0	592	850	860	974	963	959
11	814	61	0	0	0	0	592	853	855	972	963	960
12	806	50	0	0	0	0	593	860	853	972	963	960
13	802	0	0	0	0	0	594	877	853	972	963	960
14	773	0	0	0	0	0	588	873	853	972	963	960
15	683	0	0	0	0	0	586	871	870	972	963	961
16	622	0	0	0	0	0	590	869	892	972	963	960
17	621	0	0	0	51	68	594	865	892	972	963	962
18	619	0	0	0	60	77	597	809	892	972	962	962
19	619	0	0	0	0	155	599	649	892	972	961	963
20	619	0	0	55	0	258	601	644	895	972	961	964
21	617	0	0	47	0	257	603	638	895	969	961	964
22	618	0	62	0	0	256	596	751	896	969	961	963
23	617	0	63	0	0	254	652	836	899	969	961	913
24	619	0	0	0	0	254	689	836	904	969	961	864
25	618	53	0	0	0	371	690	835	905	969	961	864
26	615	46	0	0	0	456	690	836	909	969	961	865
27	614	0	0	0	0	455	690	838	915	967	961	865
28	612	0	0	0	0	455	684	838	916	966	961	864
29	611	0	0	0	---	458	739	841	916	966	960	862
30	275	0	0	0	---	455	774	842	918	966	958	864
31	0	---	0	0	---	455	---	841	---	966	958	---
TOTAL	21019.00	210.00	224.00	240.00	228.00	4801.00	17927	25476	26376	29730	29842	28081
MEAN	678	7	7.23	7.74	8.14	155	598	822	879	959	963	936
AC-FT	41690	417	444	476	452	9520	35560	50530	52320	58970	59190	55700
MAX	832	61	63	75	62	458	774	877	918	975	966	964
MIN	0	0	0	0	0	455	638	843	919	958	862	

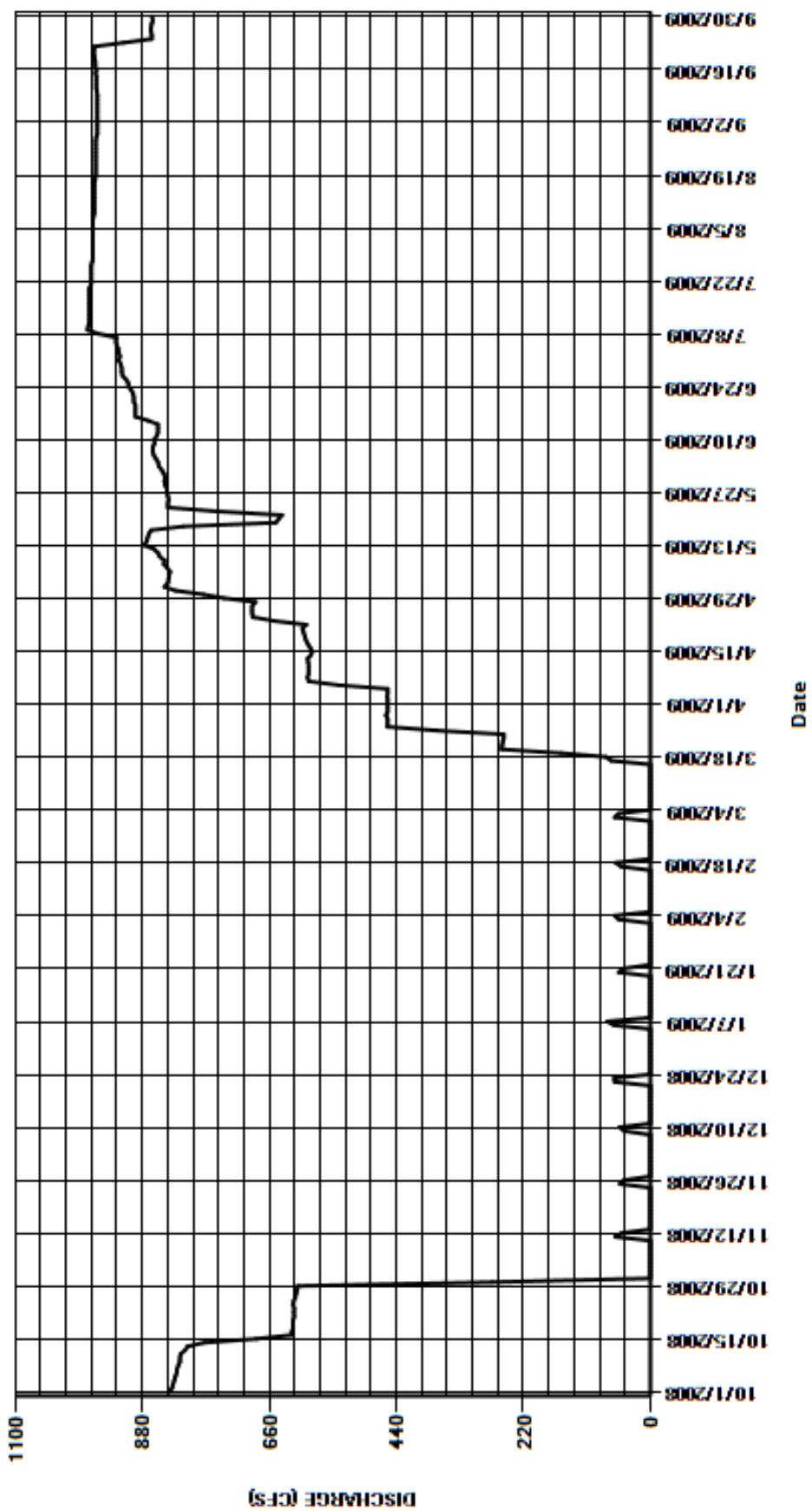
CAL YR	2008	TOTAL	161850.50	MEAN	442	MAX	942	MIN	0	AC-FT	321000
WTR YR	2009	TOTAL	184154.00	MEAN	505	MAX	975	MIN	0	AC-FT	365300

MAX DISCH: 978 CFS AT 03:00 ON Jul. 09,2009 GH 3.27 FT. SHIFT -0.14 FT.

MAX GH: 3.68 FT. AT 03:15 ON Sep. 21,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CANAL NEAR MONTROSE
WY2009 HYDROGRAPH



GUNNISON RIVER BASIN
UNCOMPAGRE RIVER NEAR OLATHE

Water Year 2009

Location.--	Lat. 38°36'05", Long. 107°58'58", SW $\frac{1}{4}$ SW $\frac{1}{4}$ of NW $\frac{1}{4}$ sec. 15, T.50 N., R. 10W, NMPM, and about 3,100 ft. above the S. H. 348 bridge and about 5,100 ft below the East Canal headgate and diversion structure, both stream distance. The gage is on the right bank and in Montrose County.
Drainage and Period of Record.--	N/A
Equipment.--	Stevens A35 graphic recorder and Sutron SatLink Logger 2 with shaft encoder in a 48" spiral culvert and stilling well. Graphic water recorder and shaft encoder are both activated by separate floats in the stilling well. The primary reference gage is a steel drop tape referenced to an adjustable RP located in the gage on the instrument shelf. The shaft encoder was replaced with a Stage Discharge Recorder on July 13, 2009. No other changes this water year
Hydrographic Conditions.--	The control is the natural streambed with a somewhat stable cobble channel. There is very little ice in winter as the releases from Ridgway Reservoir and the geothermal water from the upper Uncompahgre River in the Ouray area, help to keep the River at this point virtually free of ice. The Uncompahgre River is controlled by releases from Ridgway Reservoir and imported water through the Gunnison Tunnel during periods of low flow. The canals of the Uncompahgre Project affect the amount of discharge at this gage. The East Canal is immediately upstream, and the Ironstone Canal is above that. The automatic gates on the Ironstone cause the gage height to be very uneven as the gates seek their set level. Moss growth at low flows can change the control in just a few days.
Gage-Height Record.--	The primary record is 5-minute shaft encoder and SDR data downloaded from the Sutron SatLink Logger. Minor shaft encoder corrections resulting from calibration of the Shaft Encoder / SDR to the inside drop tape were distributed by time when they were appropriate. A flush correction was noted at 1530 on April 13, 2009 for -0.01 ft. This has been ignored because it was made during a falling stage. There were three other flush corrections made. These corrections were made on November 13, 2008 at 1026 (+0.02 ft), March 5, 2009 around 1416 (+0.02 ft), and August 20, 2009 at 1640 (-0.02 ft). There were seven SE / SDR calibration corrections made as follows: -0.02 ft on 12/15/08 at 0959, -0.01 ft on 1/16/09 at 1036, +0.02 ft on 3/2/09 at 1306, +0.03 ft on 3/23/09 at 1330, +0.03 ft on 7/13/09 at 0925, +0.01 ft on 8/20/09 at 1847, and +0.01 ft on 9/11/09 at 1750. This record is complete and reliable.
Datum Corrections.--	Levels were not run this water year. Levels were last run on August 29, 2007.
Rating.--	The control is a natural cobble channel. Rating UNCOLAC08 was developed this water year, 2009, and put into use October 1, 2008. The highest measurement was used to help better define the higher range of the rating. The mid range is similar to previous ratings, 8A and 8B. The lower range is better defined than the previous ratings during the earlier part of the year. Twelve discharge measurements (Nos. 218-229) were made during water year 2009. Measurements ranged from 1.81 cfs to 1200 cfs, which covered the range of all the flows seen, except the lower mean daily flows of Sep 10 – 13, 2009. The instantaneous peak flow of 1360 cfs occurred at 1100 June 27, 2009 (gage height of 5.75 ft with GH corr. of +0.02 ft applied, shift of 0.04 ft). The peak exceeded the stage of the high measurement No. 226 made May 19, 2009 by 0.27 ft.
Discharge.--	Shifting control method was used. Shifts were distributed by time from the beginning of the water year at 0000 hrs October 1, 2008 to measurement No. 225 at 1600 hrs April 13, 2009 and from measurement No. 228 at 1800 hrs August 20, 2009 to measurement No. 229 at 1700 hrs September 11, 2009. Shifts were distributed by stage using three variable stage-shift relationships: shift curve UNCOLA09VS1 (applied from 1700 hrs April 13, 2009 to 1000 hrs May 19, 2009); shift curve UNCOLA09VS2 (applied from 1100 hrs May 19, 2009 to 1700 hrs August 20, 2009); shift curve UNCOLA09VS3 (applied from 1800 hrs September 11, 2009 to the end of the water year at 2345 hrs September 30, 2009). Measurements made in water year 2009 showed a range in raw shifts from -0.12 ft to +0.14 ft. All measurements were given full weight and applied except Nos. 218, 219, 221, 222 and 224 which were discounted from -5% to +5% for smoothing purposes. Measurements No. 217 and 230 (a, b, & c) were used / adjusted to insure a smooth transition into and out of this Water Year, 2009. The change from rating 8A in WY2008 resulted in a disconnect between the last hours of last year and the first hours of this year. The difference was about 3%. The DMS was not changed for the adjustment of No. 217 last year using Rating No. 8A to accommodate the transition into Rating No. 8 because last year has been approved.
Special Computations.--	Discharge for periods when minor ice effect of the stage-discharge relationship was determined by evaluating the strip chart record and graph generated from the electronic data and max/min temperature data from the Montrose 2 weather station operated by the Uncompahgre Valley Water Users Association. The portions when the pen trace was jagged rather than smooth probably did have some anchor ice effect. These periods were small and of not great enough significance as to change the mean daily gage height. Further evaluation, also, indicates that the falling stage during the colder time of day is substantiation that anchor ice was not the major contributing factor. The normal pattern for anchor ice is a rising stage building going into the night time hours and a dramatically falling stage when the temperature rises the next morning or mid day whenever the ice releases. Therefore, it was determined that there was no ice affected days. The coincidence of a falling stage with colder temperatures indicates less flow because the effect of ice is a rising stage, not a decreasing stage.
Remarks.--	The record is rated good for the entire period. Gage operated and maintained by Gerald M. Thrush and Stephen W. Tuck . Record developed by Gerald M. Thrush.
Recommendations.--	

The installation of an outside gage would help determine if and when there was drawdown. The rating curve needs to be evaluated at the lower end; there appears to have been scour in the low water control. Meter notes need to note more detail about control / moss conditions.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

UNCOMPAGHRE RIVER NEAR OLATHE

RATING TABLE--

UNCOLACO8 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

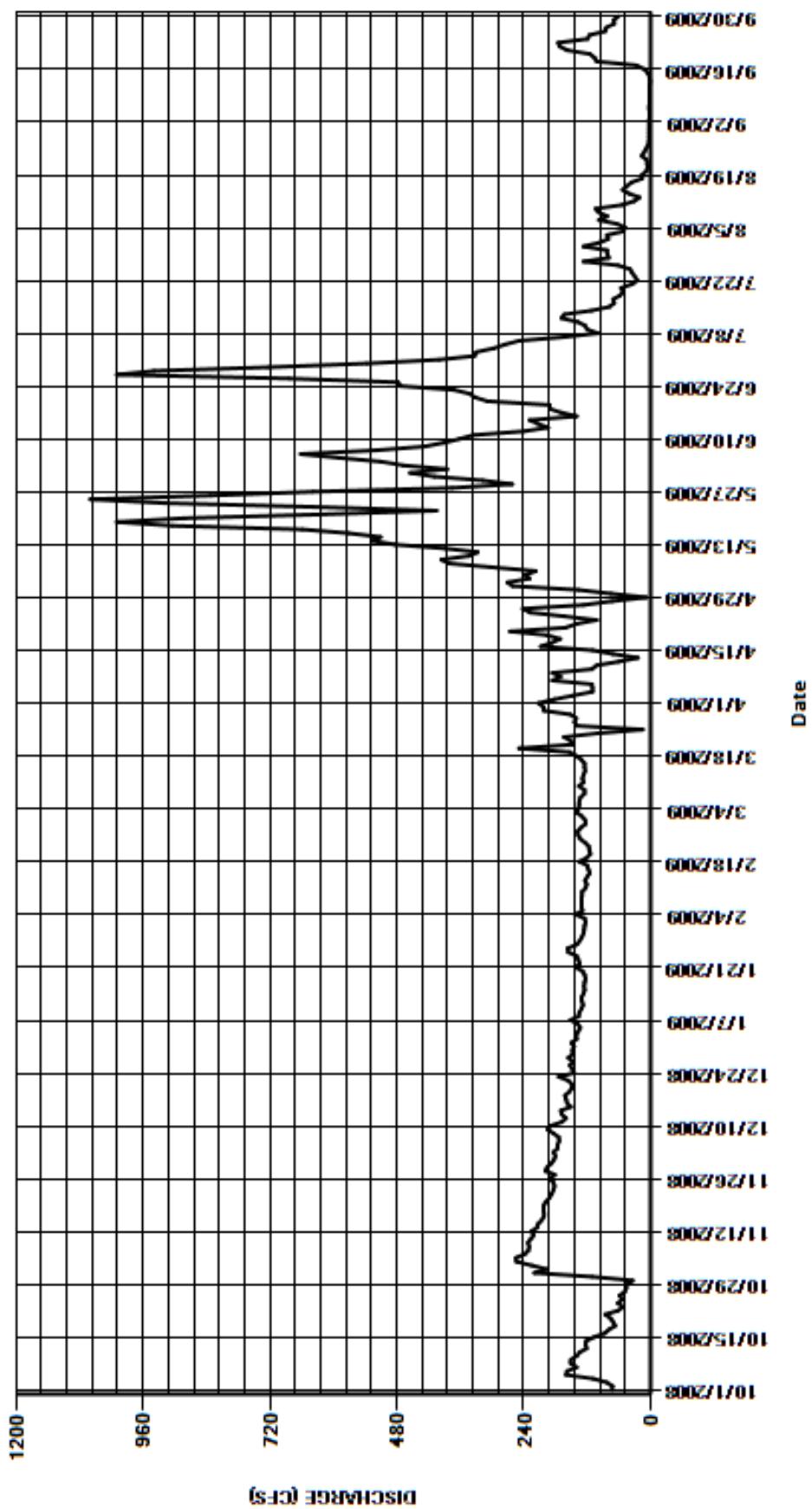
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	73	220	183	150	125	124	212	137	455	400	97	2.6
2	72	197	180	140	123	130	182	261	385	333	80	2.6
3	83	225	184	141	125	140	147	271	468	330	83	2.6
4	109	254	176	137	143	137	110	229	511	297	52	2.4
5	160	255	176	133	129	135	110	237	589	276	48	2.5
6	158	238	173	138	131	135	111	217	662	249	64	2.7
7	140	231	174	152	131	133	186	300	518	164	98	2.4
8	151	230	184	136	131	125	170	381	427	100	82	2.4
9	151	232	195	135	130	125	186	396	391	120	98	1.9
10	140	227	189	131	130	136	111	344	362	124	104	1.5
11	134	221	168	128	123	127	102	327	336	138	54	1.6
12	121	226	160	130	121	129	60	390	241	169	31	1.6
13	123	215	168	131	124	127	24	484	194	163	21	1.4
14	122	213	170	127	120	124	71	528	213	112	41	2
15	107	206	151	125	115	125	110	511	229	78	53	5.7
16	87	202	158	126	118	125	208	571	140	69	45	12
17	79	202	160	125	120	131	187	659	170	71	36	27
18	67	203	162	123	135	141	171	905	191	58	16	102
19	71	202	154	125	121	153	196	1010	191	52	16	106
20	76	197	149	129	114	249	266	882	309	56	7.6	115
21	86	191	149	142	116	148	161	626	332	35	5.9	158
22	62	187	156	134	117	151	140	405	343	25	6.7	172
23	52	184	174	137	124	164	102	639	372	30	7.7	175
24	62	182	145	140	133	100	163	919	473	35	17	119
25	53	184	148	156	137	15	228	1060	478	39	12	116
26	59	192	153	157	138	140	242	832	684	62	8.3	86
27	49	181	146	140	132	144	127	639	1010	127	4.4	84
28	46	199	156	134	123	141	73	376	940	79	3.2	69
29	45	196	147	130	---	152	8.3	262	724	82	3.2	70
30	34	188	148	127	---	202	75	317	537	82	2.9	61
31	111	---	145	126	---	203	---	409	---	127	2.9	---
TOTAL	2883	6280	5081	4185	3529	4311	4239.3	15524	12875	4082	1200.8	1507.9
MEAN	93	209	164	135	126	139	141	501	429	132	38.7	50.3
AC-FT	5720	12460	10080	8300	7000	8550	8410	30790	25540	8100	2380	2990
MAX	160	255	195	157	143	249	266	1060	1010	400	104	175
MIN	34	181	145	123	114	15	8.3	137	140	25	2.9	1.4

CAL YR	2008	TOTAL	80288	MEAN	219	MAX	827	MIN	25	AC-FT	159300
WTR YR	2009	TOTAL	65698.0	MEAN	180	MAX	1060	MIN	1.4	AC-FT	130300

MAX DISCH: 1360 CFS AT 11:00 ON Jun. 27,2009 GH 5.73 FT. SHIFT 0.04 FT.
 MAX GH: 5.75 FT. AT 11:00 ON Jun. 27,2009 (GH Correction +0.02 ft Applied)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

UNCOMPAGNE RIVER NEAR OLATHE
WY2009 HYDROGRAPH



GUNNISON RIVER BASIN
REDLANDS CANAL NEAR GRAND JUNCTION
Water Year 2009

Location.--	Lat. 39°01'49", Long. 108°33'51", in NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec 35, T1S, R1W, Mesa County, on the right bank of canal 650 ft. below the Redlands diversion dam until Oct. 25, 2004. Beginning Apr. 1, 2005, Lat. 39°02'52.93", Long. 108°34'33.16", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec 27, T1S, R1W on the right bank just downstream of and attached to an old bridge.
Drainage and Period of Record.--	
Equipment.--	A Sutron 9210 DCP with Modbus capabilities, Acoustic Doppler Velocity Meter (ADVM) in a cooperative agreement with the US BOR, and a Sutron Constant Flow Bubbler set to an outside staff gage. The Channel Master ADVM has the ability to give instantaneous flow readings. It produces the primary discharge record. A Sutron Satlink Logger 2 is controlled by the Sutron 9210 DCP and acts as the GOES radio transmitter. A radio attached to an antenna that has a direct line of sight to the US BOR, programmable logic controller which enables control at the canal head gate. The LOS radio and Satlink Logger 2 are connected to the 9210 via a serial cables and communication ports. The Channel Master and AccuBubble are connected to the 9210 DCP via SDI-12 communication. The following data is transmitted to the GOES satellite: GAGE_HT (CFB), DISCHRG2 (ADVM), and GAGE_HT2 (ADVM Vertical Beam). The DWR web page reports DISCHARG which is calculated from a conventional rating table. This value is less accurate than the on site flow data because there is no stage-discharge relationship. In absence of ADVM, discharge is estimated using the stage-discharge relationship from the bubbler.
Hydrographic Conditions.--	The Redlands Canal is a channel carved into the sandstone cliffs with a hard sedimentary bed rock bottom. The channel bottom is relatively flat with vertical walls along the side. Water in the canal is for power generation and irrigation. Penstock gates at the Redlands Water and Power Canal Company downstream of the gage control the flow in the canal and thus there is no unique stage-discharge relationship.
Gage-Height Record.--	ADVM COMPUTED RECORD: Directly measured flow from the ADVM was used from October 1, 2008 to June 12, 2009, and then from June 16th to September 30, 2009. The missing period lasted from the partial day of June 12, 2009 to the partial day June 16, 2009 and was filled in with stage-discharge data from the CFB.
Datum Corrections.--	Levels were not run during Water Year 2009. New bench marks were established and staff gages set at this site on Mar. 24, 2005. Levels were last run on March 24, 2006 by the US BOR in cooperation with the development of the velocity index rating for the Channel Master.
Rating.--	A. Conventional: The channel is very flat. The control is the reach of the canal along with the settings of the penstock gates and associated operation of the turbine. An electric probe controls the automatic head gate. There is an automatic control on the penstock gates too. The Redlands Canal is essentially a long fore bay. Rating No. 7 was used all year for the gage height portions. The new stage-discharge relationship for the gage was developed using ADCP measurements made on Apr. 1, 2005 and on Apr. 4, 2005. The USGS developed a stage-discharge relationship for comparison to their velocity index. Rating No. 7 is very similar to the USGS rating from 100 cfs to 1000 cfs; GH 2.10 to 7.80 ft. There were 5 measurements made during Water Year 2009 that were used for the conventional GH (stage-discharge) comparison. These were 309-313. Observations of zero flow were made on November 3, 2008; January 5, 7, February 13, and April 8, 2009. The range of stage of the measurements and observation is from 0 to 7.20 ft.; the range of discharge of measurements and observations is from 0 to 854 cfs. The instantaneous peak flow was 895 cfs with a Vertical Beam reading of 7.54 ft. at 1000 hours on May 02, 2009. It exceeded the highest measured gage height of 7.20 (No. 313) by 0.34 ft. in stage and 41 cfs in discharge. The maximum gage height recorded by the Constant Flow Bubbler was 7.51 ft. at the same time. This exceeds the highest measured gage height of 7.20 ft. (No. 313) by 0.31 ft. of stage. The 0.03 ft. difference in the two readings is acceptable due to separate locations on the right bank and turbulent conditions. These measurements and observations cover the range of flows recorded except the higher flow seen on June 15, 2009. B. Velocity Index: The velocity index was developed from measurements 292-295 and loaded into the Channel Master ADVM. The velocity index is good from a range in stage of 6.00 ft to full capacity bankfull stage somewhere above 7.6 ft. The procedure was performed on April 19, 2006. The Channel Master ADVM was set to acquire mode while connected by serial cable and the results were recorded on Dr. Randy Marsdens of Teledyne RD Instruments computer. The Stream Pro made three measurements concurrently. Each set was at three different settings of the canal. Then the data from the ADCP Stream Pro were compared to the logged data from the Channel Master. The regression analysis results indicate a single plain beams seen by the in situ, solidly mounted ADVM had a relationship to the total mean velocity seen by the movable ADCP of 0.815. This coefficient is still in operation.
Discharge.--	The Channel Master ADVM on site computed flow was used whenever it was available. This year's record has been developed from the computed flow from the ADVM. Stage-discharge values using the CFB and shifts derived from measurements were used to fill the missing period.
Special Computations.--	

On April 2nd, 2009 it was discovered that a default shape used for area had been inadvertently loaded on February 13, 2009 after the shut down. Observations comparing the values of the Channel Master computed flow to the corresponding flow of the Stream Pro during measurement #312 resulted in a correction factor of 0.868. Therefore the raw transmitted data was loaded onto an additional tab on the GH record and this correction was applied. That data was copied to a separate spreadsheet and saved as a *.csv file. This corrected data was loaded into the period from February 16, 2009 to April 2, 2009. The default configuration, also, contained a vertical beam elevation that was incorrect. This was corrected on February 17, 2009 at 1430 hours. Therefore the period from the correction back to the first readings when the canal came back on had to have an additional correction applied of -0.62 ft. in elevation. This was reduced to a percentage of the vertical beam reading and applied to the previously corrected values because of the wrong area / shape in the configuration file. The percentages were hand calculated and the correction factors ran in a separate column on the extra tab of the GH record spreadsheet. These factors ranged from 0.912 to 0.961. This assumes that the correction of -0.62 ft. was constant from the observation to the beginning of the canal being filled.

Remarks--

The record is rated good when the ADVM was operating from October 1, 2008 through February 16, 2009; April 3 through June 11, 2009; and June 17 through September 30, 2009. A correction coefficient was applied from February 18 through April 2, 2009. This period is rated fair. Two correction coefficients were applied on February 16 and 17, 2009; and stage-discharge data was used to estimate the period from June 12 through June 16, 2009 when the ADVM locked up. These two periods are rated poor. Gage operated and maintained by and record developed by Gerald M. Thrush.

Recommendations--

The velocity index needs to be verified. The main focus should be on the operational, full canal. The Rio Grand Workhorse ADCP should be used. The level of the vertical beam should be verified.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

REDLANDS CANAL NEAR GRAND JUNCTION

RATING TABLE--

STCONVERT USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	810	743	772	633	0	779	790	779	826	826	840	829
2	814	457	768	601	0	780	786	778	821	830	831	686
3	801	0	769	609	0	772	753	786	821	824	829	821
4	792	0	768	602	0	772	753	763	807	824	825	805
5	805	0	765	234	0	747	761	766	805	822	820	770
6	825	277	760	0	0	732	501	765	815	828	820	782
7	821	805	761	0	0	811	55	775	813	825	829	796
8	817	785	763	0	0	809	545	790	806	828	831	800
9	819	765	765	0	0	802	803	788	808	830	826	810
10	816	785	755	0	0	802	788	800	810	825	837	791
11	810	787	741	0	0	806	766	798	805	818	830	792
12	821	776	773	0	0	791	776	788	e816	815	818	807
13	812	779	770	0	0	798	765	808	e835	822	815	815
14	805	794	769	0	0	789	762	794	e852	821	825	822
15	807	771	780	0	0	790	782	794	e861	811	841	827
16	816	769	762	0	e389	789	795	786	e846	818	840	837
17	814	766	775	0	e671	793	753	808	822	820	833	839
18	813	771	790	0	763	793	748	818	822	820	817	846
19	804	771	789	0	762	808	756	808	822	826	812	851
20	790	763	785	0	767	814	772	783	823	827	818	822
21	773	784	779	0	770	799	793	790	831	829	814	826
22	767	773	780	0	772	794	778	803	835	825	814	823
23	767	760	779	0	775	805	762	805	825	820	817	823
24	775	754	771	0	790	815	772	820	826	818	827	827
25	776	752	778	0	793	795	769	841	830	823	828	827
26	774	748	783	0	789	787	771	796	822	835	829	822
27	773	756	784	0	788	793	778	784	830	840	823	829
28	770	784	767	0	782	790	781	785	833	828	820	850
29	767	785	711	0	---	781	786	800	830	823	820	842
30	769	775	693	0	---	793	801	798	819	824	821	828
31	763	---	698	0	---	792	---	810	---	829	826	---
TOTAL	24686	20035.00	23703	2679.00	9611.00	24521	22001	24607	24717	25554	25576	24445
MEAN	796	668	765	86.4	343	791	733	794	824	824	825	815
AC-FT	48960	39740	47010	5310	19060	48640	43640	48810	49030	50690	50730	48490
MAX	825	805	790	633	793	815	803	841	861	840	841	851
MIN	763	0	693	0	0	732	55	763	805	811	812	686

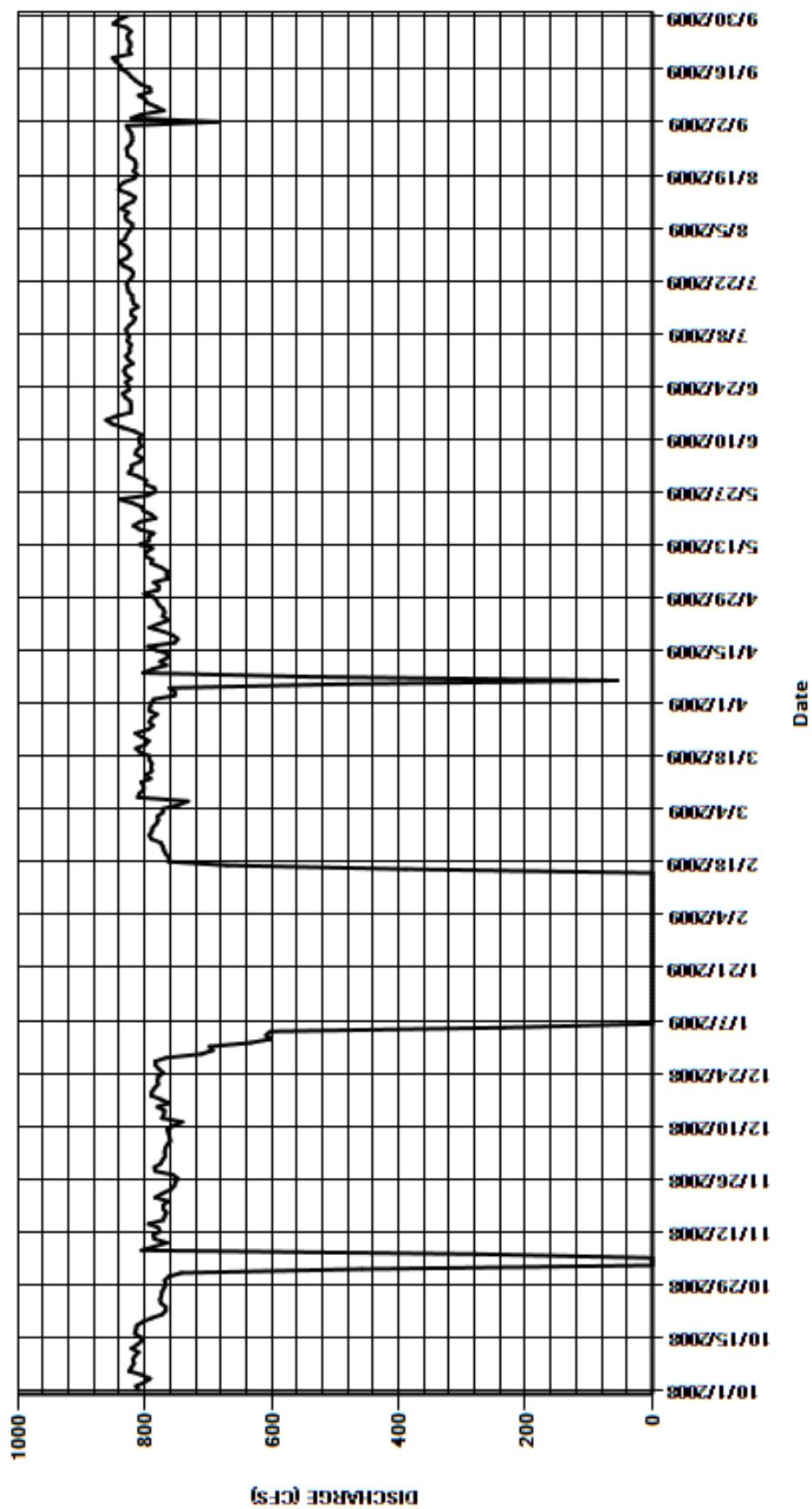
CAL YR	2008	TOTAL	282046.00	MEAN	771	MAX	857	MIN	0	AC-FT	559400
WTR YR	2009	TOTAL	252135.00	MEAN	691	MAX	861	MIN	0	AC-FT	500100

MAX DISCH: 895 CFS AT 10:00 ON May. 02,2009 GH 7.54 FT. SHIFT 0 FT. (ADVM Vertical Beam)

MAX GH: 7.54 FT. AT 10:00 ON May. 02,2009 (ADVM Vertical Beam)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

REDLANDS CANAL NEAR GRAND JUNCTION
WY2009 HYDROGRAPH



GUNNISON RIVER BASIN
GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
Water Year 2009

Location.--	Lat. 39°02'17", Long. 108°34'13", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec 26, T.1 S., R.1 W., Mesa County, on the right bank of the Gunnison River just up stream of the Department of Energy Compound, about 1.6 miles above the mouth and the Colorado River, and about 0.78 miles below the Redlands Canal Diversion Dam.
Drainage and Period of Record.--	
Equipment.--	A Sutron Satlink Logger high data rate DCP with a Sutron AccuBubble. The AccuBubble was replaced on 5/19/2009 with a Sutron Constant Flow Bubbler (CFB). The shelter is a 48-inch CMP culvert on a concrete pad. The primary reference is an outside cantilever chain gage which can be used at low gage readings if the bank is trenched; it is used up to gage height 13.00 ft. The secondary reference gage is a section of staff gage that is carried to and placed at the top of the brass nut at the end of the orifice line. Gage height of the brass nut is 0.70 ft. This is used to calibrate the AccuBubble at extremely low flows and is more accurate under these circumstances than the cantilever because the cantilever is 60+ ft. downstream.
Hydrographic Conditions.--	The control is the natural streambed with a somewhat stable cobble channel. There is very little ice in winter except for the coldest times in the year and this is not as apparent especially during higher flows around 1000 cfs. The Redlands Canal Diversion Dam is 0.78 miles upstream and diverts water in the range of 700 to 800 cfs all year for power generation, and during irrigation season it pumps an additional 60 cfs. Reservoirs up stream include Taylor Park Reservoir, Blue Mesa Reservoir, Morrow Point Reservoir, Crystal Reservoir and Ridgway Reservoir. The higher discharges probably starting around 5,000 cfs and flood flows around the range of 18,000 cfs will obviously experience back water from the Colorado River.
Gage-Height Record.--	The primary record is hourly averages of 15-minute bubbler data from satellite telemetry with DCP download data used for backup purposes. The gage was visited on 12 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The bubbler was adjusted on 5 separate occasions this water year. The sensor corrections ranged from (-) 0.07 to (+) 0.10 ft. All corrections made were prorated by time back to the last known matched readings. No flush corrections were made this water year. This record is complete and reliable except for the following days when ice affected the stage discharge relationship: Dec. 28-31, 2008 and Jan. 1-9, 2009.
Datum Corrections.--	Levels were not run this water year. Levels were last run in 2002.
Rating.--	The control is the natural streambed with a somewhat stable cobble channel. At high flows in the range of 18,000 cfs and above, backwater from the Colorado River affects the control. Rating table GUNREDCO04 in use since October 1, 2004, was used the entire Water Year. Six discharge measurements (Nos. 122-127) were made during WY2009, ranging in discharge from 496 cfs to 1190 cfs. This range is seen in all but 24 days which were below this value: November 26, 27; December 6- 8, 10-13, 16, 20-25, 27 and 28, 2008; February 17-20; March 5 and 6, 2009. There were 158 mean daily flows recorded above the measured range: October 6-9, 12; November 2-5, 2008; January 5-31; February 1-15; March 23, 24; April 7, 9-30; May 1-31; June 1-30; July 1-14; September 24 and 25, 2009. The peak instantaneous flow at 2145 May 13, 2009 (10,900 cfs, GH = 9.81 ft, shift=-0.24 ft) exceeded the stage of measurement No. 127, made September 23, 2009 by 6.88 feet in stage.
Discharge.--	Shifting control method was used during all periods of record. Shifts were distributed by time from 0000 October 1, 2008 to 1400 April 4, 2009 (121 through 122, 123, 124, 125, to 126) and from 1600 July 17, 2009 through 2345 September 30, 2009 (125 through the end of WY09 to 128 on Oct. 29, 2009). During the remainder of the water year a variable stage-shift relationship was applied. GUNREDCO09VSA was applied through the high flow period (1500 April 2, 2009 to 1500 July 17, 2009). Open water discharge measurements demonstrated shifts ranging from 0.00 to +0.04 ft. All of these were given full weight and applied directly except #124 and #126. They were discounted +2 and +3% respectively to smooth shift distribution.
Special Computations.--	The ice effect this year was mostly anchor ice. During the lower flows and cold temperatures the river was frozen over well below the gage. The ice periods were estimated using adjacent good record days, a graph of 15 min. data and a thermograph from temperatures taken from the Accububble logged at the DCP. The ice estimates used a graph from the 15 min. data, and a thermograph using transmitted data. This temperature sensor is not as accurate as the NOAA data used in previous years. The coarseness, however, is compensated for by its proximity.
Remarks.--	The record is rated as good, except when the stage-discharge relationship was affected by ice and whenever the flows were greater than 9,660 cfs (150% of the historical highest discharge measurement made in WY2008), which should be considered poor. Discharges between 6,450 (meas. No. 119) and 9,660 should be considered fair and the instantaneous peak discharge should be considered poor. Gage operated and maintained by and record developed by Gerald M. Thrush .
Recommendations.--	A few higher measurements would extend the upper end of the rating curve. These are difficult because the high water measurements have to be made from a boat owned and operated by the Bureau of Reclamation. Scheduling difficulties leads to missing high water opportunities. Then a better projection could be made with more high water measurements at the high end of the curve. The use of ADCP measurements will allow more frequent high water measurements in that a cable does not have to be strung across the river to stabilize the boat for a conventional measurement. Levels need to be run.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

GUNNISON RIVER BELOW REDLANDS DIVERSION DAM

RATING TABLE--

GUNREDSCO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1120	939	535	594	1480	591	897	4700	5140	4440	1160	944
2	1130	1220	517	762	1470	600	938	5210	5030	4150	1090	973
3	1020	1600	516	730	1470	562	848	6530	5270	3880	1060	740
4	960	1620	514	874	1420	572	879	5850	5660	3910	990	673
5	1090	1580	501	1240	1400	406	920	5380	5730	3840	954	593
6	1270	1170	488	1400	1480	330	1120	5070	5940	3730	946	608
7	1230	643	489	1490	1500	592	1540	5520	5930	3390	1010	644
8	1190	728	495	1490	1500	588	1160	6580	5600	2830	1030	640
9	1200	771	525	1430	1510	585	1290	7330	5090	2370	1010	642
10	1180	749	476	1380	1500	608	1460	7550	4960	2100	1080	617
11	1180	737	418	1320	1480	631	1320	8030	4660	1830	1030	624
12	1240	680	474	1340	1350	598	1500	8140	4330	1740	938	674
13	1170	652	493	1410	1370	617	1290	9640	3960	1590	915	705
14	1100	735	562	1450	1370	605	1240	10000	3870	1320	972	746
15	1070	609	513	1440	1330	598	1620	9010	3910	1080	1070	796
16	1070	589	478	1430	786	608	2230	8390	3810	979	1120	827
17	1050	584	497	1420	495	614	2510	8080	3690	974	1090	874
18	1020	588	510	1420	468	638	2440	7760	3650	925	995	928
19	1010	581	511	1410	431	733	2580	7470	3640	894	938	1020
20	1040	577	484	1420	477	809	3050	6940	3640	905	941	1040
21	1060	727	458	1380	528	928	3660	6220	3860	921	924	1180
22	1080	647	447	1390	535	1110	4720	5420	4050	893	917	1180
23	1090	555	452	1470	553	1210	5070	5180	3840	868	935	1190
24	1140	535	405	1540	654	1250	5450	5650	3780	862	997	1240
25	1150	520	441	1630	725	993	5490	7600	4070	890	1010	1210
26	1150	467	522	1680	702	886	5370	7370	4550	971	993	1170
27	1130	471	493	1600	671	956	4680	6440	5520	1150	952	1120
28	1120	595	435	1510	632	909	4050	5800	5630	1160	944	1060
29	1110	603	560	1480	---	881	3450	5240	5260	1070	940	999
30	1130	547	608	1490	---	934	3780	5100	4790	1060	944	956
31	1090	---	698	1480	---	927	---	5070	---	1080	973	---
TOTAL	34590	23019	15515	42100	29287	22869	76552	208270	138860	57802	30868	26613
MEAN	1116	767	500	1358	1046	738	2552	6718	4629	1865	996	887
AC-FT	68610	45660	30770	83510	58090	45360	151800	413100	275400	114700	61230	52790
MAX	1270	1620	698	1680	1510	1250	5490	10000	5940	4440	1160	1240
MIN	960	467	405	594	431	330	848	4700	3640	862	915	593

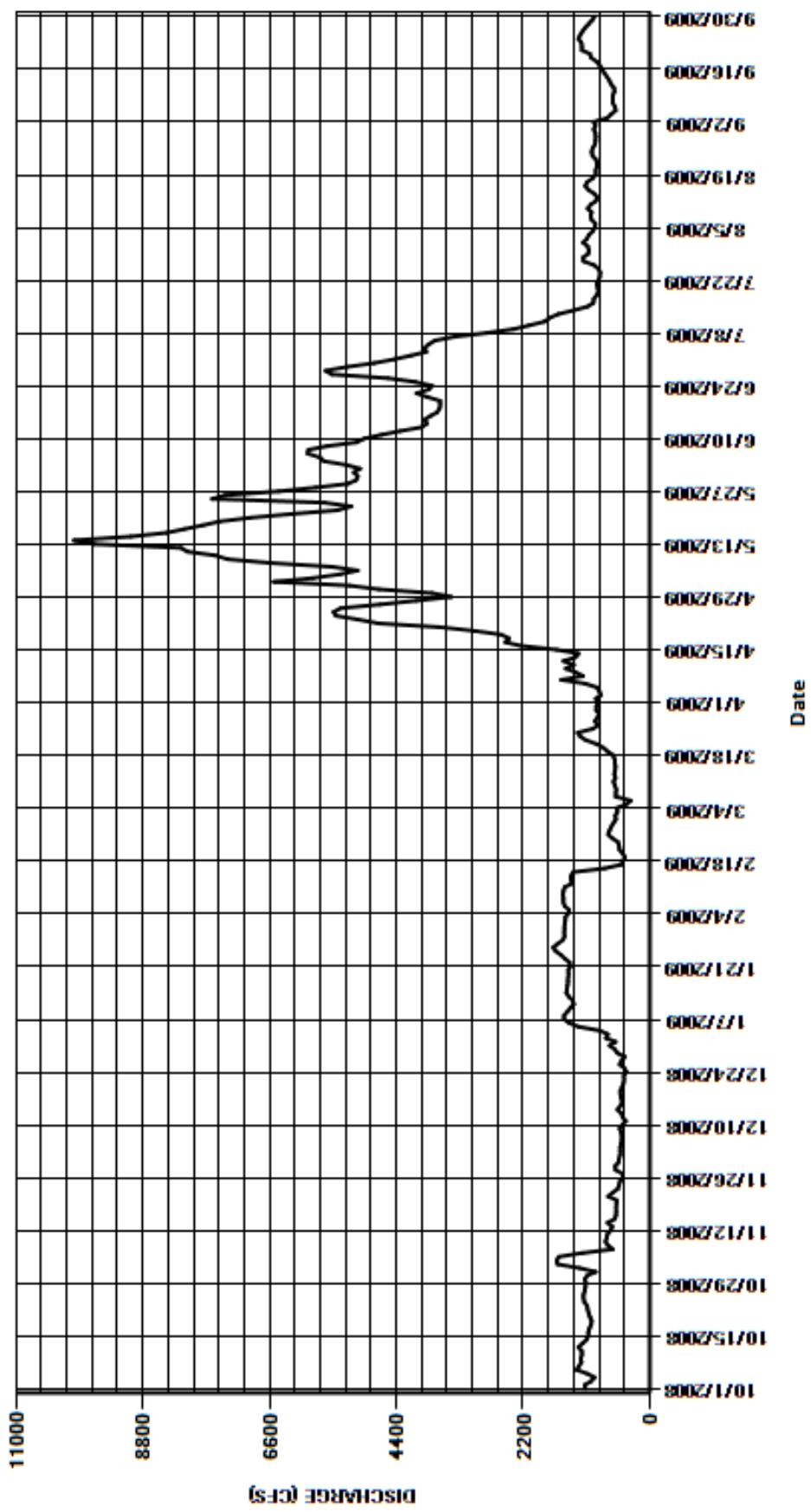
CAL YR	2008	TOTAL	937998	MEAN	2563	MAX	11900	MIN	369	AC-FT	1861000
WTR YR	2009	TOTAL	706345	MEAN	1935	MAX	10000	MIN	330	AC-FT	1401000

MAX DISCH: 10900 CFS AT 21:45 ON May. 13,2009 GH 9.72 FT. SHIFT -0.24 FT.

MAX GH: 9.72 FT. AT 21:45 ON May. 13,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
WY2009 HYDROGRAPH



BLUE RIVER BASIN
BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE
Water Year 2009

Location.--	Lat. 39°32'29", Long. 106°02'40", in SE 1/4 SW 1/4 sec. 7, T.6 S., R.77 W., Hydrologic Unit 14010004, Summit County, on right bank 25 ft. above Highway 9 Bridge, 3 1/2 miles north of Breckenridge and 2 1/4 miles south of Dillon Reservoir(Blue River Arm).
Drainage and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder and satellite telemetry system (Sutron 8500 shaft encoder and Sutron 8210/SatLink DCP) in pre-cast concrete building and stilling well. Well inside building has two intake pipes with flush risers outside. Graphic recorder and shaft encoder have separate floats and are set by drop tape to an adjustable inside reference point. Station has AC power that allows use of a stock tank heater and space heater to prevent well and intakes from freezing during winter. No changes this water year.
Hydrographic Conditions.--	Transmountain diversions above the station occur through the Continental-Hoosier Tunnel and the Boreas Pass Ditch.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data. Chart record is used for backup. The record is complete and reliable over the entire water year. A chart recorder problem resulted in no chart data to use as backup from Aug 7-18, 2009. No flush corrections were applied. Shaft encoder corrections were applied throughout the period of record.
Datum Corrections.--	Levels were last run on Sep 16, 2008 using RM 1 as base. No corrections were necessary at that time.
Rating.--	Low water control is rock and cobble riffle at the gage house. High water control is three 8'0" culverts 25 ft below gage house under Highway 9. Channel is often mossy in fall and winter. Rating No. 9, dated Nov 20, 2008 was used from Oct 1-20, 2008. Rating No. 10 was developed Nov 6, 2009 based on WY2009 measurements and was applied to gage height data for remainder of WY 2009. Discharge measurements 119-128 made during the water year, and measurement 129 made subsequently, were used for analysis. The measurements ranged from 16.3 to 306 cfs, which covers the range of discharge experienced in WY 2009 except for the higher daily flows of June 3, 4, 27, and 28; and the lower daily flows of Jan 16,17, Feb 20-23 and 28, Mar 1, 2, 9, and 12. The peak gage height of 2.49 ft occurred Jun 3 at 08:45 when a shift of zero resulted in a maximum discharge of 379 cfs. The peak gage height exceeded high measurement 126 by 0.30 ft in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were distributed by time for the entire period of record. Measurements made this year indicate raw shifts ranging from -0.04 to +0.04 ft. Measurements 121-123 and 125 were discounted from -6% to +2% to smooth the shift distribution.
Special Computations.--	None
Remarks.--	Record is rated as good. Station was maintained, and the record developed by Craig Bruner.
Recommendations.--	Run levels in WY 2010 and determine point of zero flow.

STATE OF COLORADO
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BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE

RATING TABLE--

BLUNINCO09 USED FROM 01-Oct-2008 TO 20-Oct-2008
BLUNINCO10 USED FROM 20-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	29	20	18	18	16	20	81	238	262	117	43
2	31	29	19	18	18	16	20	95	278	246	104	42
3	34	29	19	18	17	17	20	99	361	260	90	41
4	35	29	20	18	17	17	21	95	340	262	81	40
5	36	29	20	17	17	17	20	90	306	250	74	40
6	37	27	18	17	17	17	19	87	286	247	66	41
7	39	24	18	18	17	17	19	103	266	226	62	40
8	38	23	18	19	17	17	20	127	236	212	57	38
9	36	23	19	19	17	16	22	127	218	203	54	37
10	35	24	19	19	17	17	22	125	211	192	52	37
11	32	25	18	18	17	17	23	122	206	182	50	36
12	36	25	17	18	17	16	24	137	196	188	48	35
13	41	26	18	17	17	17	24	154	187	177	47	36
14	38	28	19	17	17	17	25	161	192	165	46	45
15	37	27	19	17	17	17	26	169	193	154	48	51
16	36	24	19	16	17	17	28	174	187	142	50	66
17	36	24	18	16	17	18	29	178	183	134	47	70
18	36	26	19	17	17	19	27	189	189	123	45	63
19	36	27	19	17	17	20	27	204	196	117	43	55
20	35	27	19	17	16	20	28	207	211	106	45	51
21	37	25	20	17	16	21	30	213	230	99	48	50
22	38	24	20	17	16	22	36	232	226	93	47	55
23	35	23	21	17	16	23	43	226	240	88	44	54
24	30	22	22	17	17	23	51	244	253	84	45	51
25	30	21	22	18	17	22	57	253	277	82	48	49
26	31	20	22	18	17	22	63	248	292	85	50	47
27	33	19	21	18	17	21	61	233	345	90	48	46
28	32	20	20	18	16	20	54	215	327	91	46	46
29	33	21	20	17	---	20	54	208	295	90	44	44
30	31	21	19	17	---	20	64	210	285	116	42	41
31	29	---	19	18	---	20	---	217	---	123	42	---
TOTAL	1074	741	601	543	473	579	977	5223	7450	4889	1730	1390
MEAN	34.6	24.7	19.4	17.5	16.9	18.7	32.6	168	248	158	55.8	46.3
AC-FT	2130	1470	1190	1080	938	1150	1940	10360	14780	9700	3430	2760
MAX	41	29	22	19	18	23	64	253	361	262	117	70
MIN	29	19	17	16	16	16	19	81	183	82	42	35

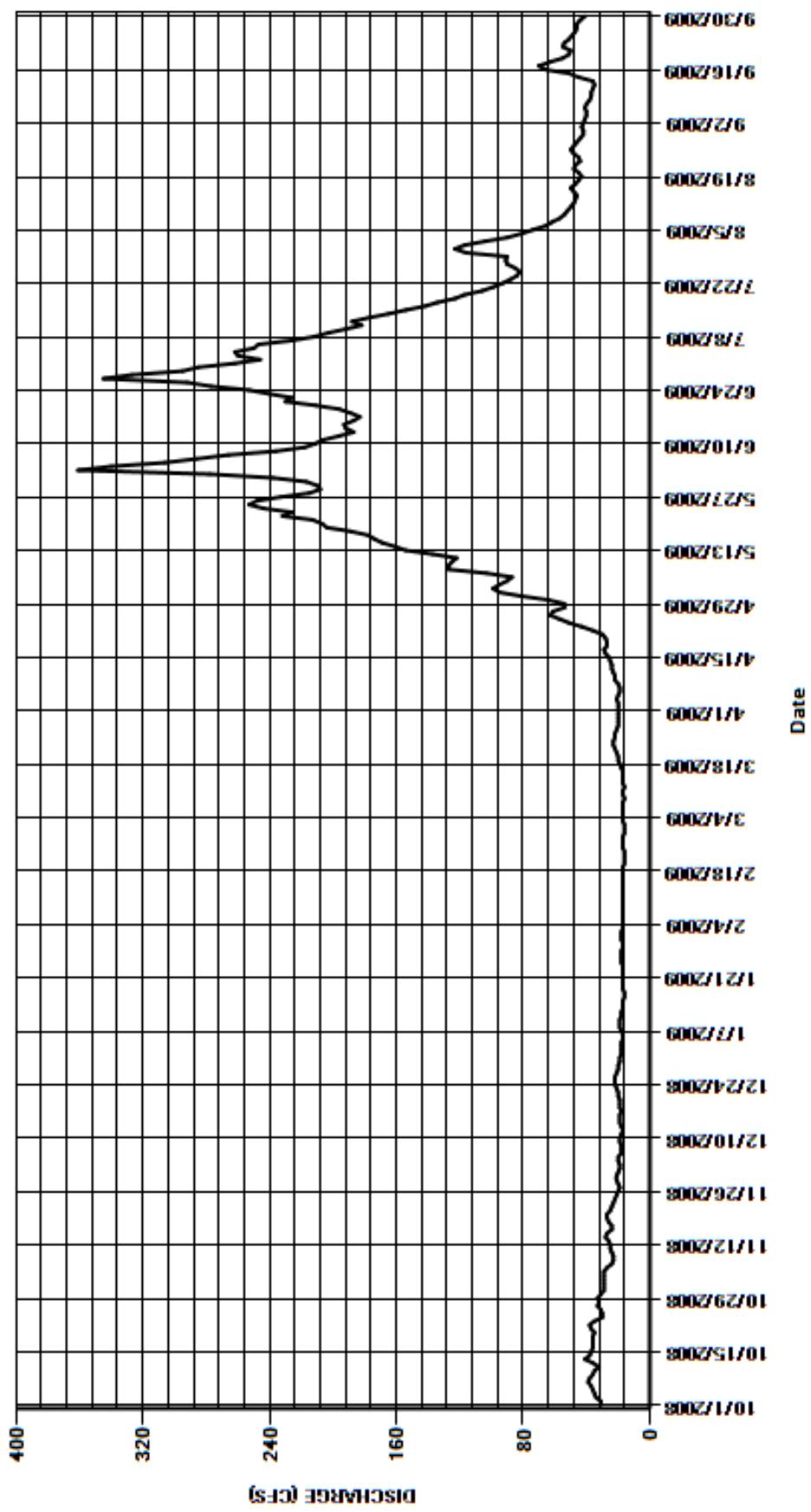
CAL YR	2008	TOTAL	23703	MEAN	64.8	MAX	272	MIN	13	AC-FT	47010
WTR YR	2009	TOTAL	25670	MEAN	70.3	MAX	361	MIN	16	AC-FT	50920

MAX DISCH: 379 CFS AT 08:45 ON Jun. 03,2009 GH 2.49 FT. SHIFT 0 FT.

MAX GH: 2.49 FT. AT 08:45 ON Jun. 03,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE
WY2009 HYDROGRAPH



BLUE RIVER BASIN
SNAKE RIVER AT KEYSTONE SKI AREA
Water Year 2009

Location.--	Lat 39°36'24", long 105°57'06", in NE1/4 NE1/4 Sec. 24, T5S, R77W in Summit County. Located on left bank just below Keystone Ski Area snowmaking diversion, 0.5 mi below confluence with North Fork of Snake River, 1.5 mi above confluence with Keystone Gulch, and 3.2 mi upstream of Snake River Arm of Dillon Reservoir.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Model 5600 AccuBubble sensor and Sutron SatLink data collection platform (DCP) are housed in the Keystone Ski Area snowmaking diversion/pump building. The AccuBubble is calibrated to a staff gage located above rock weir control and below Keystone diversion dam. Control is a "W"-shaped rock weir approximately 20 feet below the gage.
Hydrographic Conditions.--	Drainage basin is the main stem of the Snake River. Record includes bypass water (pumped from Montezuma shaft of Roberts Tunnel) that is not diverted for snowmaking. Banks between the dam and control are steep and velocity is generally slow in this reach. Channel below the control is composed of cobble and is relatively straight to the measurement section. There is one channel at all stages.
Gage-Height Record.--	The primary record is hourly averages of fifteen minute satellite data. Record is complete and reliable for the six month period of operation (Oct 1, 2008 – Mar 31, 2009), except for the periods of Oct 1, 2008 (DCP disabled), Dec 21-31, 2008 (erratic bubbler performance), Jan 14 – Feb 6, 2009 (dead battery). Discharges during these periods were estimated by comparison with adjacent good gage height data and calculated discharges. An instrument calibration correction was made to the sensor on Feb 6, 2009.
Datum Corrections.--	Levels were run on Sep 25, 2009. Using RM 1 as a base the staff gage was determined to be set 0.04 ft low, resulting in gage height readings that were 0.04 ft high. The staff gage elevation was corrected in the field and a -0.04 ft datum correction was applied to the gage height data for the entire period of record from Oct 1, 2008 until Mar 31, 2009.
Rating.--	Control is a W-shaped rock weir structure approximately 100 ft downstream of the Keystone snowmaking diversion point and 20 ft downstream of AccuBubble orifice pipe. Rating No. 12 (dated March 10, 2008) was used for all of Water Year 2009. Four measurements (21–24), and measurement 25 made subsequently, were used for this analysis. Measurements range in discharge from 15.0 to 26.2 cfs, which covered the range of flows experienced in WY 2009, except for the lower daily flows of Nov 6, 7; Dec 9-11, 15, 20; Jan 4, 6, 8-10, 12-31; and Feb 1 – Mar 31 and the higher daily flows of Oct 1–21, 25-26, 28-30; and Nov 1-3. The peak gage height of 2.19 ft (gage height correction of -0.04 ft applied) occurred on Oct 12, 2008 at 02:00 when a shift of 0.00 resulted in a maximum discharge of 46.4 cfs. The peak gage height exceeded high measurement 24 by 0.18 ft in stage.
Discharge.--	A shifting control method was used for the period of record. Shifts were prorated by time between measurements for the entire water year. Raw shifts ranged from -0.03 to +0.02 ft. Measurements 21-25 were discounted from -3% to +4 % to smooth the shift distribution.
Special Computations.--	Discharges during periods of no gage height (Oct 1, Dec 23-31, 2008, and Jan 14 – Feb 6, 2009) were estimated by straight-line proration between adjacent good gage height data and calculated discharges.
Remarks.--	Record is rated good, except for periods of estimated daily discharge which are considered as poor. Station operated by Craig Bruner and record developed by James Kellogg.
Recommendations.--	Run levels in late Sept to confirm staff gage elevation prior to start of next period of record. Consider construction of a cantilever chain gage to replace staff gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SNAKE RIVER AT KEYSTONE SKI AREA

RATING TABLE--

SNAKEYCO12 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	27	21	22	12	12	---	---	---	---	---	---
2	34	27	22	20	12	12	---	---	---	---	---	---
3	34	27	18	18	12	12	---	---	---	---	---	---
4	34	24	18	13	12	12	---	---	---	---	---	---
5	34	16	16	15	12	11	---	---	---	---	---	---
6	34	11	20	14	12	11	---	---	---	---	---	---
7	32	12	22	15	12	11	---	---	---	---	---	---
8	32	22	17	14	12	10	---	---	---	---	---	---
9	31	23	14	14	12	11	---	---	---	---	---	---
10	30	20	14	13	12	10	---	---	---	---	---	---
11	32	18	14	15	12	10	---	---	---	---	---	---
12	37	17	17	14	12	11	---	---	---	---	---	---
13	30	21	19	14	12	11	---	---	---	---	---	---
14	30	16	16	14	12	10	---	---	---	---	---	---
15	29	15	13	14	12	10	---	---	---	---	---	---
16	29	20	17	14	12	11	---	---	---	---	---	---
17	28	22	16	14	12	11	---	---	---	---	---	---
18	27	25	17	14	12	11	---	---	---	---	---	---
19	27	24	16	14	11	12	---	---	---	---	---	---
20	27	22	14	13	11	12	---	---	---	---	---	---
21	28	22	15	13	11	12	---	---	---	---	---	---
22	23	19	15	13	11	14	---	---	---	---	---	---
23	25	19	16	13	11	14	---	---	---	---	---	---
24	25	17	17	13	12	12	---	---	---	---	---	---
25	27	18	17	13	11	12	---	---	---	---	---	---
26	29	19	18	13	11	11	---	---	---	---	---	---
27	25	22	19	13	10	11	---	---	---	---	---	---
28	27	20	19	13	11	11	---	---	---	---	---	---
29	27	18	20	13	---	11	---	---	---	---	---	---
30	27	20	21	13	---	11	---	---	---	---	---	---
31	26	---	21	13	---	11	---	---	---	---	---	---
TOTAL	914	603	539	441	326	351	---	---	---	---	---	---
MEAN	29.5	20.1	17.4	14.2	11.6	11.3	---	---	---	---	---	---
AC-FT	1810	1200	1070	875	647	696	---	---	---	---	---	---
MAX	37	27	22	22	12	14	---	---	---	---	---	---
MIN	23	11	13	13	10	10	---	---	---	---	---	---

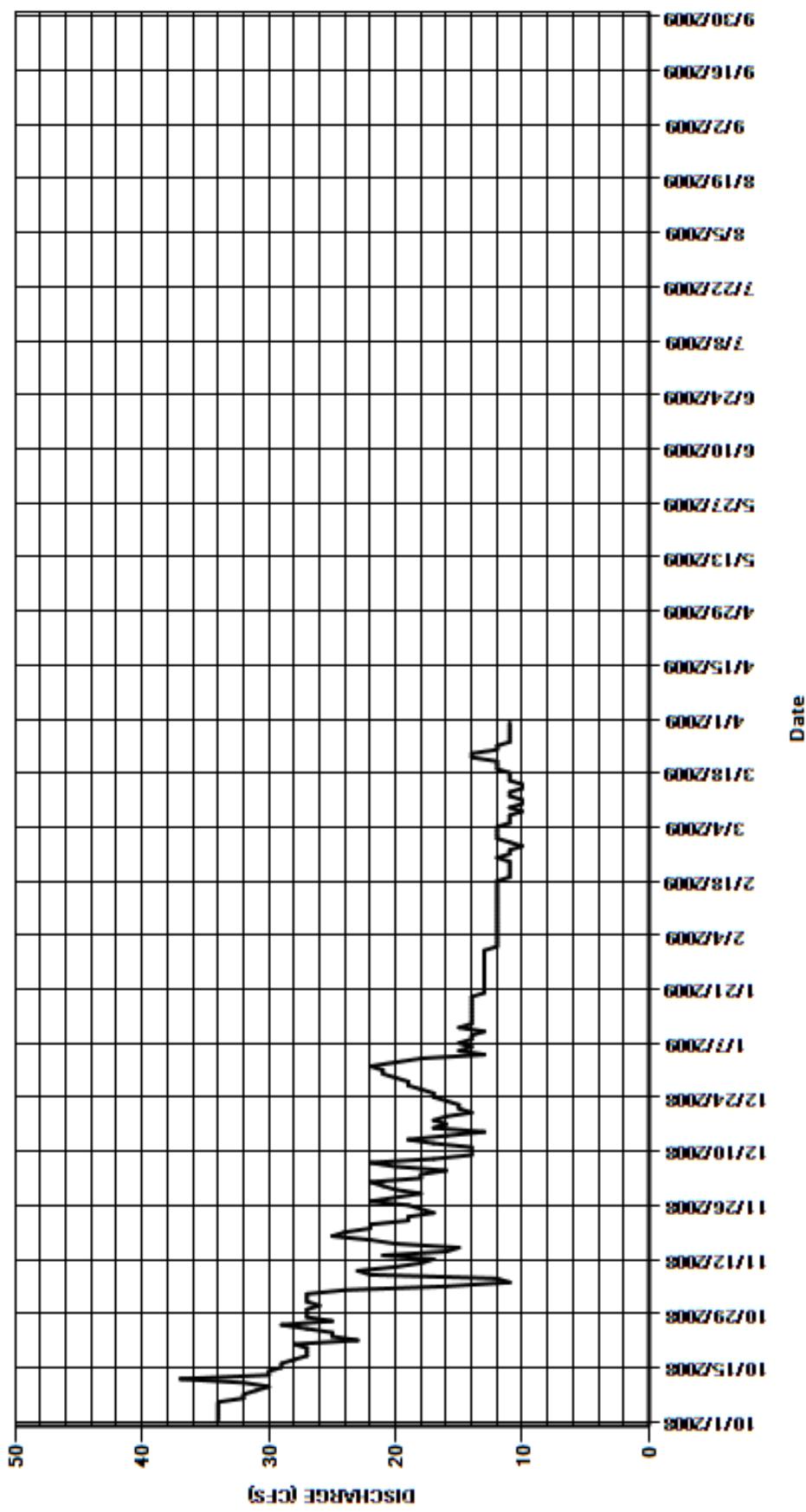
CAL YR	2008	TOTAL	3293	MEAN	18	MAX	37	MIN	11	AC-FT	6530 (PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	3174	MEAN	17.4	MAX	37	MIN	10	AC-FT	6300 (PARTIAL YEAR RECORD)

MAX DISCH: 46 CFS AT 02:00 ON Oct. 12,2008 GH 2.19 FT. SHIFT 0 FT. (DATUM CORR. -0.04 FT. APPLIED)

MAX GH: 2.19 FT. AT 02:00 ON Oct. 12,2008 (DATUM CORR. -0.04 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SNAKE RIVER AT KEYSTONE SKI AREA
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN
Water Year 2009

Location.-- Lat. 39°13'30", Long. 106°51'20", NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, T.9 S., R.85 W., Pitkin County, on left bank at Aspen Consolidated Sanitation Plant 0.5 mi east of Aspen Airport and 0.8 mi downstream from confluence of Maroon Creek.

Drainage and Period of Record.-- N/A

Equipment.-- Station is equipped with Stevens A-71 graphic water-stage recorder and Sutron Model 56-0540 shaft encoder and Sutron SatLink2 data collection platform (DCP) housed in precast concrete building with a 12.5 ft deep well. Stilling well is connected to stream by two 2" diameter intake pipes with outside riser pipes for flushing. Graphic recorder and shaft encoder have separate floats and are set to an inside reference point with a drop tape.

Hydrographic Conditions.-- Upstream transmountain diversions occur through Hunter Tunnel (part of Fryingpan-Arkansas system) and Twin Lakes Tunnel. Building is equipped with AC power which allows use of a space heater and a stock tank heater. Well and intakes do not freeze. Anchor ice forms in the control during very cold weather and causes a backwater affect.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with chart record used for backup. The record is complete and reliable for Water Year 2009, except for Dec 25, 28, 29, 31; and Jan 1, 5-8, 28-30 when the stage-discharge relationship was affected by anchor ice in the natural control. Several shaft encoder corrections were applied during the period of record. No flush corrections were applied in Water Year 2009.

Datum Corrections.-- Levels were run to inside gage on Oct 6, 2008. Using RM 2 as a base, the gage was found to read correct and the R.P. was not adjusted.

Rating.-- Channel is composed of cobble throughout and is straight from 400 ft above to 100 ft below the gage. Banks are steep on right bank and medium on left bank. The low flow control is a rock and cobble riffle about 80 ft below the gage. High flow control is 20 ft. boulder about 100 ft downstream of gage. Rating 5 (developed Feb 29, 2009) was used for WY 2009. Discharge measurements 192-200 made during Water Year 2009, and measurement 201 made subsequently, were used for analysis. Measurements ranged from 102 to 1040 cfs, which covered the range experienced during the year except for the lower daily flows on Jan 28 and the higher daily flows of May 15-27, 30, 31; Jun 1-7, 19-30; and Jul 1-3. The peak gage height of 4.97 ft occurred on May 19 at 04:45 when a shift of +0.17 ft resulted in a maximum discharge of 2330 cfs. The peak gage height exceeded high measurement 198 by 0.77 ft in stage.

Discharge.-- Shifting control method used for Water Year 2009. Shifts were distributed by time from Oct 1, 2008 until Feb 11, 2009. The shifts were applied using variable stage-shift relationship ROABMCCOV09 from Feb 11, 2009 until the end of the water year. The variable stage-shift relationship is based on measurement nos. 195-201 and recent high flow measurement no. 189. Measurements indicated raw shifts ranging from -0.07 to +0.09 ft. Measurements 192-195, 197, 199 and 200 were discounted -6% to +4% to smooth discharges calculated with Rating 5.

Special Computations.-- Gage heights for the periods of ice effect were graphically estimated from adjacent days with good chart record. Discharge estimates for the ice-affected days were based on these estimated gage heights.

Remarks.-- Record is good, except during periods of ice-affected control when record is rated as fair. Station operated and maintained and record developed by James Kellogg.

Recommendations.-- Cableway is due for inspection.

STATE OF COLORADO
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ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN

RATING TABLE--

ROABMCC05 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

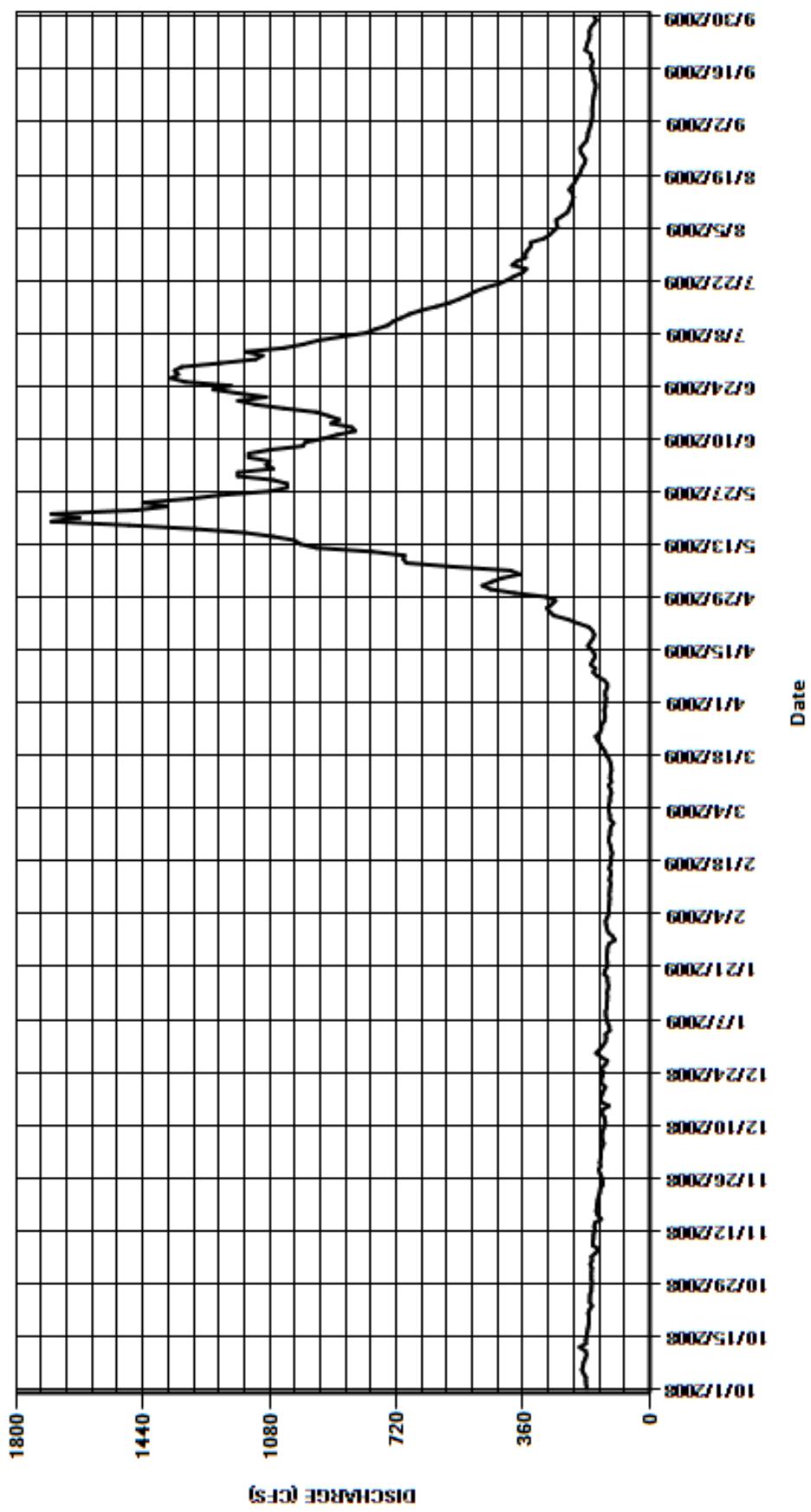
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	179	166	140	126	124	113	127	452	1170	1120	339	169
2	181	165	139	124	126	113	124	476	1070	1100	302	166
3	182	169	139	126	121	116	127	449	1090	1150	285	164
4	182	164	136	114	117	116	126	419	1080	1040	274	163
5	188	166	131	115	117	116	121	369	1140	984	262	164
6	193	154	135	120	116	113	121	396	1140	943	265	163
7	190	145	136	123	115	113	131	558	1080	877	266	162
8	188	162	135	125	114	109	150	692	986	806	249	161
9	183	162	131	126	115	112	161	700	979	779	234	159
10	180	160	127	122	114	117	155	697	927	745	229	157
11	182	160	127	123	113	109	168	790	888	730	224	154
12	200	156	129	121	111	113	163	947	837	706	220	154
13	181	158	137	120	115	112	156	993	847	683	217	159
14	182	156	134	122	112	109	158	1010	906	649	220	159
15	179	138	116	119	110	110	165	1070	882	606	229	163
16	178	148	137	118	116	112	176	1150	913	569	221	168
17	176	152	140	120	112	116	169	1290	947	541	213	165
18	174	151	136	120	111	124	161	1480	1040	516	208	162
19	173	150	132	130	110	127	158	1700	1120	496	200	167
20	173	148	126	127	107	135	163	1620	1170	468	196	168
21	175	146	138	121	110	141	173	1700	1090	430	192	183
22	171	142	138	121	112	148	204	1460	1170	405	185	180
23	164	141	134	122	116	154	232	1370	1240	386	183	177
24	171	134	132	122	117	142	272	1440	1190	362	190	172
25	170	134	139	121	113	138	284	1310	1320	351	197	171
26	170	137	126	120	113	138	293	1220	1360	391	198	172
27	166	141	121	116	111	130	279	1080	1340	378	189	168
28	166	146	139	99	103	127	268	1030	1350	353	180	159
29	164	140	153	106	---	128	296	1030	1330	354	177	152
30	166	142	142	118	---	130	384	1070	1220	347	176	159
31	166	---	133	122	---	126	---	1170	---	338	172	---
TOTAL	5493	4533	4158	3729	3191	3807	5665	31138	32822	19603	6892	4940
MEAN	177	151	134	120	114	123	189	1004	1094	632	222	165
AC-FT	10900	8990	8250	7400	6330	7550	11240	61760	65100	38880	13670	9800
MAX	200	169	153	130	126	154	384	1700	1360	1150	339	183
MIN	164	134	116	99	103	109	121	369	837	338	172	152
CAL YR	2008	TOTAL	157544	MEAN	430	MAX	2570	MIN	91	AC-FT	312500	
WTR YR	2009	TOTAL	125971	MEAN	345	MAX	1700	MIN	99	AC-FT	249900	

MAX DISCH: 2330 CFS AT 04:45 ON May. 19,2009 GH 4.97 FT. SHIFT 0.17 FT.
MAX GH: 4.97 FT. AT 04:45 ON May. 19,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ROARINGFORKRIVER BELOW MAROON CREEK NEAR ASPEN
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
ROARING FORK RIVER AB FRYINGPAN RIVER NR BASALT
Water Year 2009

Location.--	Lat 39° 21'40", Long. 107°01'44" in SW1/4 NE1/4 Sec. 18, T8S, R86W in Pitkin County. Located on left bank of Roaring Fork River, just below Highway 82 bridge, 0.5 mi. above confluence with Fryingpan River, and 2.5 mi. above confluence with Sopris Creek.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Model 5600 AccuBubble sensor and Sutron SatLink 2 data collection platform (DCP) housed in 2 ft rectangular steel shelter. AccuBubble sensor is referenced to an outside cantilever chain gage that was last calibrated on Oct 16, 2008. A new AccuBubble sensor was installed on Sep 3 because the previous unit had a compressor leak that resulted in erroneously low gage heights for much of the period from Aug 8 through Sep 3. No other changes this water year.
Hydrographic Conditions.--	Drainage basin is upper reach of Roaring Fork Valley. Transmountain diversions from several tributaries at the upper end of the basin occur seasonally. Confluence with Fryingpan River is about ½ mi. downstream. The gage is operated from Apr 1 through Oct 31.
Gage-Height Record.--	The primary record is hourly averages of 15-minute DCP log data, with satellite data used as backup. The record is complete and reliable for the period of record, except for Aug 8 through Sep 3 when a compressor leak in the AccuBubble sensor resulted in many erroneously low gage heights. Calibration corrections to the AccuBubble were made on Apr 2 (+0.18 ft), Apr 20 (-0.03 ft), May 21 (+0.35 ft due to shifted orifice pipe in high flows), and Jul 27 (-0.16 ft). For these days, gage heights were revised for the hour in which sensor calibrations were made to accurately calculate discharge.
Datum Corrections.--	Levels were run on Oct 8, 2008 (outside the period of gage operation) to calibrate the cantilever chain gage and establish RM 3 and RM 4. Using RM 1 as a base, the gage was found to read correct and no corrections were made.
Rating.--	Control is cobble and boulder channel. Left side of channel at gage is deeper with steep bank. Right side of channel slopes gently to a cobble bar with moderate willow growth. At higher stages, flow rises above cobbles and willows on right bank. Moss and algae growth are negligible. Since peak discharge of Jun 2008 cobbles and boulders have filled and reduced depths in the left side of the channel and resulted in the need for a new rating for WY 2009. Rating No. 4 was developed from measurements 8-14 and implemented on Apr 1, 2009 and used for the entire water year. It is defined from 179 cfs to 3,600 cfs (150 % of highest discharge measurement made in WY 2009). The upper end of the rating (above 400 cfs) needs to be better defined over time. Four discharge measurements (Nos. 11-14) made during WY 2009 were used for analysis. The measurements range in discharge from 179 to 2390 cfs. Measurement 12 made during high stage flow was made from the downstream side of the Basalt Avenue (first measurement at this location) and was rated a relatively poor measurement due to hydrologic conditions. Overbank flow at the Midland Avenue Bridge (previous high stage measurement location) prevented high stage measurements. Measurements cover the range of discharge experienced during the period of record except for the lower daily flows of Apr 2, 5-6; Aug 22-24, 27-31; and Sep 1-30 and the higher daily flows of May 19-21, 2009. The peak gage height of 4.52 feet occurred at 02:15 on May 19, 2009, when a shift of -0.08 ft resulted in a maximum discharge of 3620 cfs. The peak gage height exceeded high measurement 12 by 0.39 ft in stage.
Discharge.--	Shifting channel control method was used for the entire period of record (Apr 1 – Sep 30). Variable stage-shift curve ROAFRYCOVS09 was defined by measurement Nos. 11-14 and shifts were distributed by stage using the variable stage-shift curve for the entire period. All measurements were given full weight except for Measurement No. 11, which was discounted -6% to smooth shift distribution. Measurements show raw shifts varying between -0.08 to 0.00 ft.
Special Computations.--	Gage heights for days with faulty accububble operation were estimated based on the recorded gage heights that were judged as accurate. These were then used to estimate the discharge. A hydrographic comparison of ROAFRYCO record was made with downstream gage on Roaring Fork River near Emma (ROAEMMCO). Considering inflows from the Fryingpan River, the comparison shows consistency between the discharges measured at the two gages.
Remarks.--	Record is rated as good, except for the period when the AccuBubble compressor was malfunctioning from Aug 8 through Sep 3, which is rated fair. Gaging station operated and maintained by James Kellogg. Discharge record was developed by James Kellogg.
Recommendations.--	Continue cooperation with CWCB to design and construct cableway about 700 feet downstream of gaging station. Use cableway to obtain better quality high stage discharge measurements and better define upper end of rating table.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ROARING FORK RIVER AB FRYINGPAN RIVER NR BASALT

RATING TABLE--

ROAFRYCO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	179	664	1860	1800	470	152
2	---	---	---	---	---	---	174	704	1730	1750	430	149
3	---	---	---	---	---	---	191	681	1750	1810	403	147
4	---	---	---	---	---	---	191	661	1770	1660	375	145
5	---	---	---	---	---	---	176	591	1830	1550	356	145
6	---	---	---	---	---	---	170	607	1820	1450	345	145
7	---	---	---	---	---	---	187	773	1690	1340	351	145
8	---	---	---	---	---	---	225	927	1470	1230	334	144
9	---	---	---	---	---	---	250	941	1420	1170	320	142
10	---	---	---	---	---	---	241	911	1340	1100	307	139
11	---	---	---	---	---	---	275	1020	1310	1070	273	135
12	---	---	---	---	---	---	265	1220	1230	1040	249	133
13	---	---	---	---	---	---	247	1300	1200	986	241	139
14	---	---	---	---	---	---	260	1270	1300	922	241	141
15	---	---	---	---	---	---	276	1330	1280	858	253	147
16	---	---	---	---	---	---	301	1440	1340	781	249	157
17	---	---	---	---	---	---	276	1650	1390	745	234	150
18	---	---	---	---	---	---	252	1760	1530	711	216	148
19	---	---	---	---	---	---	246	2650	1630	690	202	152
20	---	---	---	---	---	---	259	2440	1780	654	192	152
21	---	---	---	---	---	---	294	2550	1670	613	179	168
22	---	---	---	---	---	---	355	2230	1720	577	173	176
23	---	---	---	---	---	---	406	2070	1890	549	173	178
24	---	---	---	---	---	---	476	2250	1830	508	176	173
25	---	---	---	---	---	---	494	2100	2000	487	179	172
26	---	---	---	---	---	---	514	1910	2260	531	179	171
27	---	---	---	---	---	---	479	1730	2230	538	170	165
28	---	---	---	---	---	---	446	1630	2200	495	167	157
29	---	---	---	---	---	---	468	1600	2070	489	161	156
30	---	---	---	---	---	---	569	1670	1870	486	158	177
31	---	---	---	---	---	---	---	1830	---	464	158	---
TOTAL	---	---	---	---	---	---	9142	45110	50410	29054	7914	4600
MEAN	---	---	---	---	---	---	305	1455	1680	937	255	153
AC-FT	---	---	---	---	---	---	18130	89480	99990	57630	15700	9120
MAX	---	---	---	---	---	---	569	2650	2260	1810	470	178
MIN	---	---	---	---	---	---	170	591	1200	464	158	133

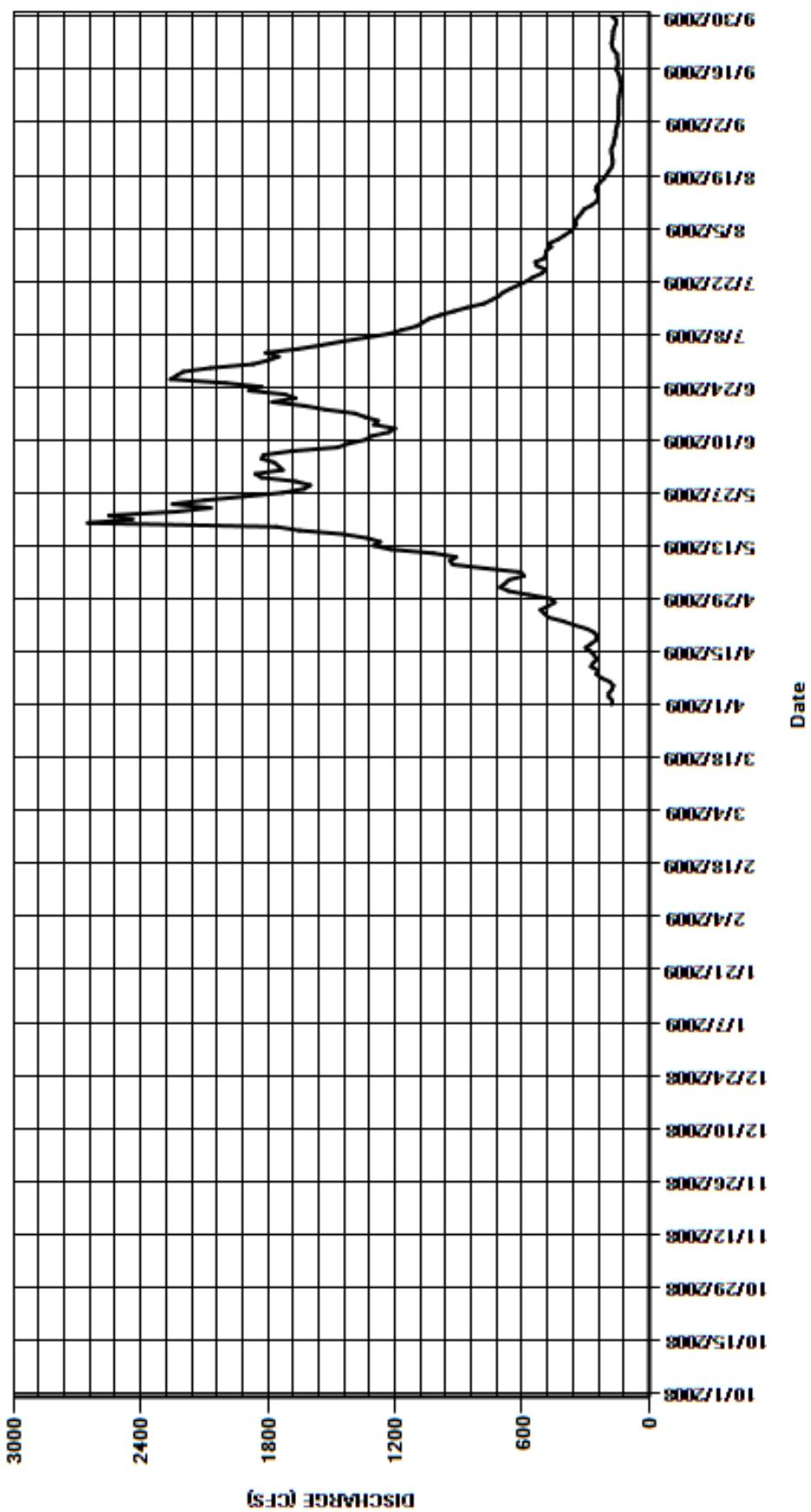
CAL YR	2008	TOTAL	191773	MEAN	1048	MAX	4480	MIN	135	AC-FT	380400 (PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	146230	MEAN	799	MAX	2650	MIN	133	AC-FT	290000 (PARTIAL YEAR RECORD)

MAX DISCH: 3620 CFS AT 02:15 ON May. 19,2009 GH 4.52 FT. SHIFT -0.08 FT. (GH CORR. 0.35 FT. APPLIED)

MAX GH: 4.52 FT. AT 02:15 ON May. 19,2009 (GH CORR. 0.35 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ROARINGFORKRIVER AB FRYINGPAN RIVER NR BASALT
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN

09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE

Water Year 2009

Location.-- Lat. 39°14'42", Long. 106°31'50", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on left bank 100 ft downstream from diversion dam, 2 mi southwest of Ivanhoe Lake, and 9.1 mi southeast of Norrie, CO.

Drainage and Period of Record.-- 18.7 mi².

Equipment.-- Sutron Model SDR-0001-4 stage discharge recorder (installed to replace a sutron Model SDR-0001-1 on Jul 22, 2009) in 3'-0" square doghouse style metal-clad shelter on 24" diameter corrugated metal well located directly in stream. SDR is set by drop tape to an inside reference point on edge of equipment shelf. The SDR is hardwired to Chapman control house where a SatLink2 data collection platform (DCP) provides satellite transmission. The USBR Stevens 4-20 mA shaft encoder inside shelter was removed on Jul 22, 2009. Control is a 9.8-ft. wide sharp-crested concrete weir 20 ft. below gage.

Hydrographic Conditions.-- Drainage basin is National Forest land, primarily wilderness area. Diversion dam is just upstream of station. Diverted water and discharge from Fryingpan-Arkansas collection tunnels (north and south tunnels converge above station) flow into Charles H. Boustead Tunnel, which carries water transmountain to the Arkansas River Basin (since May 16, 1972). Well and control freeze during winter months.

Gage-Height Record.-- The primary record is hourly averages of fifteen-minute SDR data. The record is complete and reliable for WY 2009, except for the period of Nov 5, 2008 through Apr 8, 2009 when the well and control were frozen. Minor instrument corrections were applied during the year.

Datum Corrections.-- Levels were run on Jul 22, 2009. Using RM 1 as a base, the gage was found to read correct and no change was made to the R.P.

Rating.-- Channel is composed of boulders and cobbles. Control is a 9.8 ft wide rectangular concrete weir. Rating No. 8 has been in use since Oct 1, 1983. Five discharge measurements (371-375) made during WY 2009, and measurement 376 made subsequently, were used for analysis. The measurements ranged in discharge from 8.64 cfs to 14.1 cfs and cover the range experienced during the year except for lower daily flows on Nov 5-7, 10-30, Dec 1-31, Jan 1-31, Feb 1-28, Mar 1-31, and Apr 1-21; and higher daily flows of May 18-21, 3-31, June 1, 18-26, Jul 18-31, Aug 1-27, and Sep 13, 20-22, 25-27. The peak gage height of 2.11 (GH corr. = +0.04 applied) occurred on May 18 at 23:15 when a shift of -0.03 ft resulted in a maximum discharge of 90.2 cfs. The peak gage height exceeded the highest measurement 373 by 0.95 ft in stage.

Discharge.-- A shifting control method was used for WY 2009. Shifts were applied and distributed by time for entire period of record. Raw shifts ranged from -0.01 ft to -0.06 ft. Measurements 372, 373 and 375 were discounted -5% to +5% to smooth the shift distribution.

Special Computations.-- Daily discharges for days with no gage height record (well frozen from Nov 13, 2008 through Apr 8, 2009) were estimated by hydrographic comparison with downstream gaging station on Fryingpan River near Thomasville (FRYTHOCO).

Remarks.-- Record is good, except for period of no gage height record, which is poor. Gaging station operated by and discharge record developed by Craig Bruner.

Recommendations.-- Develop new rating without the random curvature of Rating No. 8.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE

RATING TABLE--

FRYIVLCO08 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	9	6.4	5.8	3.8	3	3.5	11	15	14	42	13
2	12	9	6.4	5.3	3.9	2.9	3.4	12	14	14	35	12
3	12	9.5	6.6	5.2	4	3	3.4	12	14	14	32	12
4	12	9.1	6.3	4.7	4	3.1	3.2	12	14	14	30	13
5	12	8.1	6.1	5	4	3.1	3.1	11	14	14	28	12
6	13	6	6.3	5.1	3.8	3.1	3.2	11	14	14	28	12
7	13	6.5	5.8	4.9	3.6	2.9	4	11	13	14	27	12
8	12	9.2	5.8	4.7	3.6	2.8	6	9.8	13	14	25	12
9	12	8.7	5.6	4.7	3.6	3	7.3	10	13	14	23	12
10	11	8	5	4.7	3.4	3	6.6	11	13	14	22	11
11	12	7.9	5.3	4.5	3.4	2.9	6.8	12	13	14	21	11
12	13	7.7	5.3	4.5	3.2	3.2	6.5	12	13	14	20	12
13	12	7.6	6	4.4	3.2	2.9	6.4	12	14	14	19	16
14	11	7.2	5.6	4.4	3.2	3	6.6	12	14	14	22	13
15	11	5.1	4.8	4.4	3	3.1	7.2	13	14	14	23	13
16	11	7.5	5.6	4.2	2.9	3.1	7.9	13	14	14	20	14
17	11	7.7	5.7	4.3	3	3.5	7.6	13	14	14	18	12
18	10	7.2	5.7	4.6	3	4.1	7.2	16	15	16	17	13
19	10	7	5.5	4.8	2.8	4.4	7.1	20	18	21	17	13
20	10	7	5.3	4.7	2.8	5.3	7.2	24	19	22	16	16
21	10	6.5	5.2	5.5	2.9	6	8.3	16	17	18	15	18
22	9.2	5.8	5.4	5.5	2.9	7	11	13	17	15	15	15
23	11	5.6	5.7	5.1	3	7.3	12	13	17	23	15	14
24	13	5.1	5.5	4.9	3	6.2	13	13	17	23	16	14
25	13	5.5	5.5	4.7	3.1	5.2	13	13	17	30	16	15
26	12	5.9	5.3	4.6	3	4.5	13	13	16	50	15	15
27	10	6.5	5.1	4.4	3	4.4	11	13	14	46	15	15
28	10	6.5	5.2	4	2.9	4.2	10	14	14	41	14	14
29	9.6	6.1	5	4.2	---	4.1	10	14	14	41	14	14
30	9.2	6.2	5	3.8	---	3.8	10	15	14	42	13	14
31	9.3	---	5.7	3.8	---	3.7	---	15	---	43	13	---
TOTAL	348.3	214.7	173.7	145.4	92.0	121.8	225.5	409.8	442	669	646	402
MEAN	11.2	7.16	5.6	4.69	3.29	3.93	7.52	13.2	14.7	21.6	20.8	13.4
AC-FT	691	426	345	288	182	242	447	813	877	1330	1280	797
MAX	13	9.5	6.6	5.8	4	7.3	13	24	19	50	42	18
MIN	9.2	5.1	4.8	3.8	2.8	2.8	3.1	9.8	13	14	13	11

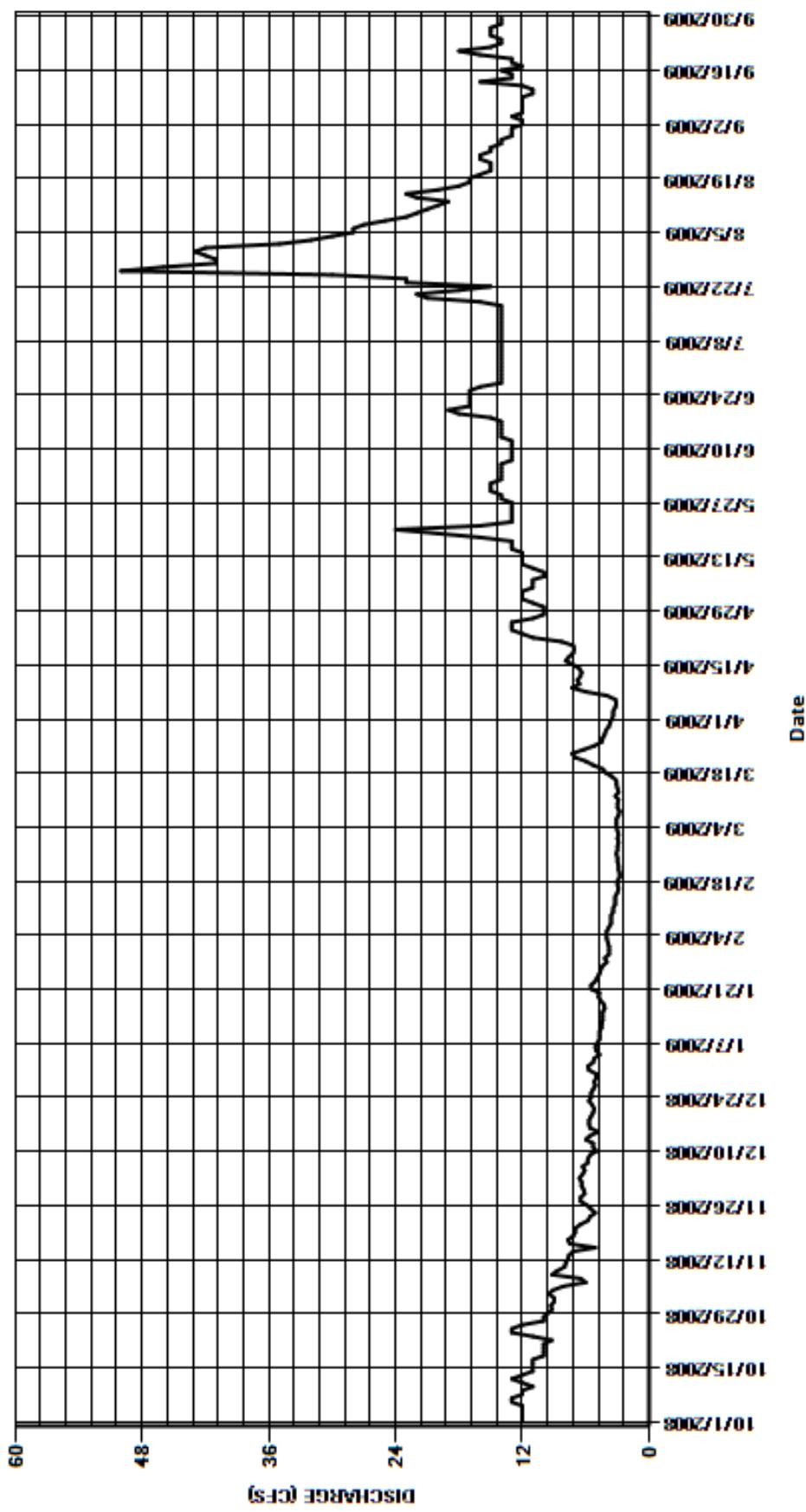
CAL YR	2008	TOTAL	4079.7	MEAN	11.1	MAX	60	MIN	3.4	AC-FT	8090
WTR YR	2009	TOTAL	3890.2	MEAN	10.7	MAX	50	MIN	2.8	AC-FT	7720

MAX DISCH: 90 CFS AT 23:15 ON May. 18,2009 GH 2.11 FT. SHIFT -0.03 FT. (GH CORR. = 0.04 FT. APPLIED)

MAX GH: 2.11 FT. AT 23:15 ON May. 18,2009 (GH CORR = +0.04 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
09077610 IVANHOE CREEK NEAR NAST
Water Year 2009

Location.-- Lat. 39°17'13", Long. 106°33'31", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on left bank 60 ft upstream from culvert under Nast Tunnel, 300 ft downstream from diversion dam, 2.3 mi east of Nast, and 5.8 mi southeast of Norrie, CO.

Drainage and Period of Record.-- 9.43 mi².

Equipment.-- Station is equipped with a Sutron stage discharge recorder (SDR) housed in a 3'-0" square metal-clad shelter on 24" diameter corrugated metal well located directly in stream. An SDR-0001-4 was installed on Jul 22, 2009 after removing Sutron Model SDR-0001-1 stage discharge recorder and Stevens 4-20 mA shaft encoder. The SDR-0001-4 is hard-wired to Chapman Control House and configured to transmit 4-20 mA gage height via satellite. SDR is set by drop tape to inside reference point. Control is a 120 deg v-notch weir (low flows) 55 ft below the gage and 8 ft culvert (high flows) 60 feet below the gage.

Hydrographic Conditions.-- Basin is approximately 9.43 sq. mi. USFS land with several seasonal roads. Transmountain diversions occur just upstream of station and are diverted to Arkansas River Basin through Charles H. Boustead Tunnel.

Gage-Height Record.-- The primary record is hourly averages of the 15-minute SDR log data. Satellite transmitted data are used as backup when available. The record is complete and reliable for Water Year 2009, except for Oct 22-25, and Nov 5 through Apr 9 when the gage stilling well and control were frozen. Minor instrument corrections were made on Oct 10, 2008 and October 23, 2009.

Datum Corrections.-- Levels were run to the inside gage R.P. Oct 10, 2008. Using RM 3 as a base, the gage was found to read 0.02 ft low. Since the RP was not adjustable, the tape was lengthened by 0.02 ft to correlate with the actual RP elevation as determined by levels. The RP/tape correction was accounted for in the shift for Measurement 230. This method was used instead of applying a correction to the gage height record back to the end of the ice period in the spring of 2008. The procedure prevented changes to the WY 2008 record and the need to republish the WY 2008 record. Gage height discrepancies (prior to and after the RP/tape correction) will be considered during development of Rating No. 5. Levels were again run on Jul 31, 2009. Using RM 3 as a base, the gage was found to read correct.

Rating.-- Low water control is 120 degree v-notch weir approximately 30 ft below gage. High water control is concrete headwall and 8 ft diameter culvert below weir. Rating No. 4 has been in use since October 1, 1996. Six discharge measurements (230-235) made during Water Year 2009, and measurement 236 made subsequently, were used for analysis. The gage stilling well was frozen at the time of measurement 231. The measurements ranged from 0.65 to 3.65 cfs, which covered the daily discharge range experienced during the period of record except for lower daily flows on Nov 15, and Feb 15-22; and higher daily flows on May 19, 20; Jul 26-31; and Sep 10-16, 2009. The peak gage height of 2.45 ft occurred at 17:30 on May 20, 2009 when a shift of +0.03 ft resulted in a maximum discharge of 68.8 cfs. The peak gage height exceeded high measurement 234 by 1.48 feet in stage.

Discharge.-- A shifting control method was used for all of Water Year 2009. Variable stage-shift curve IVCRNACOVS09 was defined by measurement 231-235 and the two highest historic measurements. Shifts were distributed by time from Oct 1 through Nov 4, 2008 except for the days with no gage height (Oct 22-25, 2008 and Nov 5, 2008 through Apr 9, 2009). The shifts were applied using variable stage-shift curve IVCRNACOVS09 from Apr 10, 2009 until the end of WY 2009. Measurements indicate raw shifts ranging from -0.01 ft to -0.04 ft. Measurement 231 was made when the gage stilling well was frozen and no shift was calculated. All measurements were given full weight except measurement 235 which was discounted 5% to develop the variable stage-shift relationship.

Special Computations.-- Average daily discharge for days with no gage height record (Oct 22-25, 2008 and Nov 5, 2008 through Apr 9, 2009) were estimated from hydrographic comparison with the downstream gage on Fryingpan River near Thomasville (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.

Remarks.-- Record is good, except for periods of no gage height record, which are poor. Station maintained and record developed by Craig Bruner.

Recommendations.-- An adjustable R.P. needs to be installed in the equipment shelter. Make site visit(s) on snowmobiles or ATVs in April and/or May to evaluate ice condition in channel, control, and stilling well. Develop new stage-discharge rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077610 IVANHOE CREEK NEAR NAST

RATING TABLE--

IVCRNAC004 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.72	0.89	0.87	0.92	0.73	0.7	1.1	2.6	3.2	2.3	3.5	2.1
2	0.69	0.91	0.87	0.84	0.76	0.7	1.1	2.5	3.1	2.2	2.9	2.1
3	0.69	1.1	0.9	0.84	0.78	0.73	1.1	2.5	3.3	2.2	2.7	2.1
4	0.75	1.1	0.87	0.76	0.78	0.76	1.1	2.4	2.8	2.2	2.5	2.1
5	0.78	0.98	0.84	0.81	0.78	0.76	1	2.3	2.5	2.3	2.3	2.1
6	1	0.73	0.87	0.84	0.76	0.76	1.1	2.4	2.3	2.2	2.7	2
7	0.99	0.78	0.81	0.81	0.73	0.73	1.4	2.7	2	2.2	2.6	2
8	0.85	1.1	0.81	0.78	0.73	0.7	2.1	2.3	1.9	2.3	2.2	2
9	0.76	1.1	0.78	0.78	0.73	0.76	2.5	2.1	1.9	2.2	2.2	1.9
10	0.67	0.98	0.7	0.78	0.7	0.76	2.8	2.2	1.9	2.3	2.1	20
11	0.65	0.98	0.76	0.76	0.7	0.76	2.5	2.5	1.9	2.3	2	33
12	1.2	0.95	0.76	0.76	0.67	0.84	2.4	2.7	1.9	2.3	2	26
13	0.86	0.95	0.87	0.76	0.67	0.76	2.4	2.2	2.1	2.2	1.9	22
14	0.75	0.9	0.81	0.76	0.67	0.78	2.4	2.2	2.2	2.2	2.3	14
15	0.77	0.64	0.7	0.76	0.64	0.84	2.4	2.2	2.3	2.2	2.9	7.7
16	0.72	0.95	0.81	0.73	0.62	0.84	2.7	2.4	2.2	2.2	2.1	4.2
17	0.71	0.98	0.84	0.76	0.64	0.95	2.6	2.6	2.2	2.2	1.9	2.4
18	0.69	0.92	0.84	0.81	0.64	1.1	2.5	3.5	2.3	2.3	1.9	1.7
19	0.68	0.9	0.81	0.84	0.62	1.2	2.4	6.6	2.2	2.3	1.8	1.5
20	0.69	0.9	0.78	0.84	0.62	1.5	2.4	17	2.3	2.3	1.6	1.6
21	0.82	0.84	0.78	0.98	0.64	1.7	2.2	3.4	2.4	2.9	1.4	2.8
22	0.82	0.76	0.81	0.98	0.64	2	2.2	3.2	2.6	3.4	1.4	2.1
23	0.7	0.73	0.87	0.92	0.67	2.1	2.2	3.6	2.5	3.4	1.4	1.7
24	0.89	0.67	0.84	0.9	0.67	1.8	2.2	3.4	2.5	3.3	1.6	1.7
25	0.89	0.73	0.84	0.87	0.7	1.5	2.3	2.9	2.5	3.2	1.6	1.8
26	1	0.78	0.81	0.84	0.7	1.3	2.3	2.8	2.6	5.3	1.6	1.9
27	0.91	0.87	0.78	0.81	0.7	1.3	2.2	2.3	2.5	4.3	2.4	1.8
28	0.93	0.87	0.81	0.76	0.67	1.3	2.2	2.2	2.3	4.9	2.5	1.6
29	0.95	0.81	0.78	0.78	---	1.3	2.3	2.4	2.2	4	2.4	1.4
30	0.95	0.84	0.78	0.73	---	1.2	2.5	2.6	2.2	5.1	2.2	1.3
31	0.88	---	0.9	0.73	---	1.1	---	2.9	---	4	2.3	---
TOTAL	25.36	26.64	25.30	25.24	19.36	33.53	62.6	99.6	70.8	88.7	66.9	170.6
MEAN	0.82	0.89	0.82	0.81	0.69	1.08	2.09	3.21	2.36	2.86	2.16	5.69
AC-FT	50	53	50	50	38	67	124	198	140	176	133	338
MAX	1.2	1.1	0.9	0.98	0.78	2.1	2.8	17	3.3	5.3	3.5	33
MIN	0.65	0.64	0.7	0.73	0.62	0.7	1	2.1	1.9	2.2	1.4	1.3

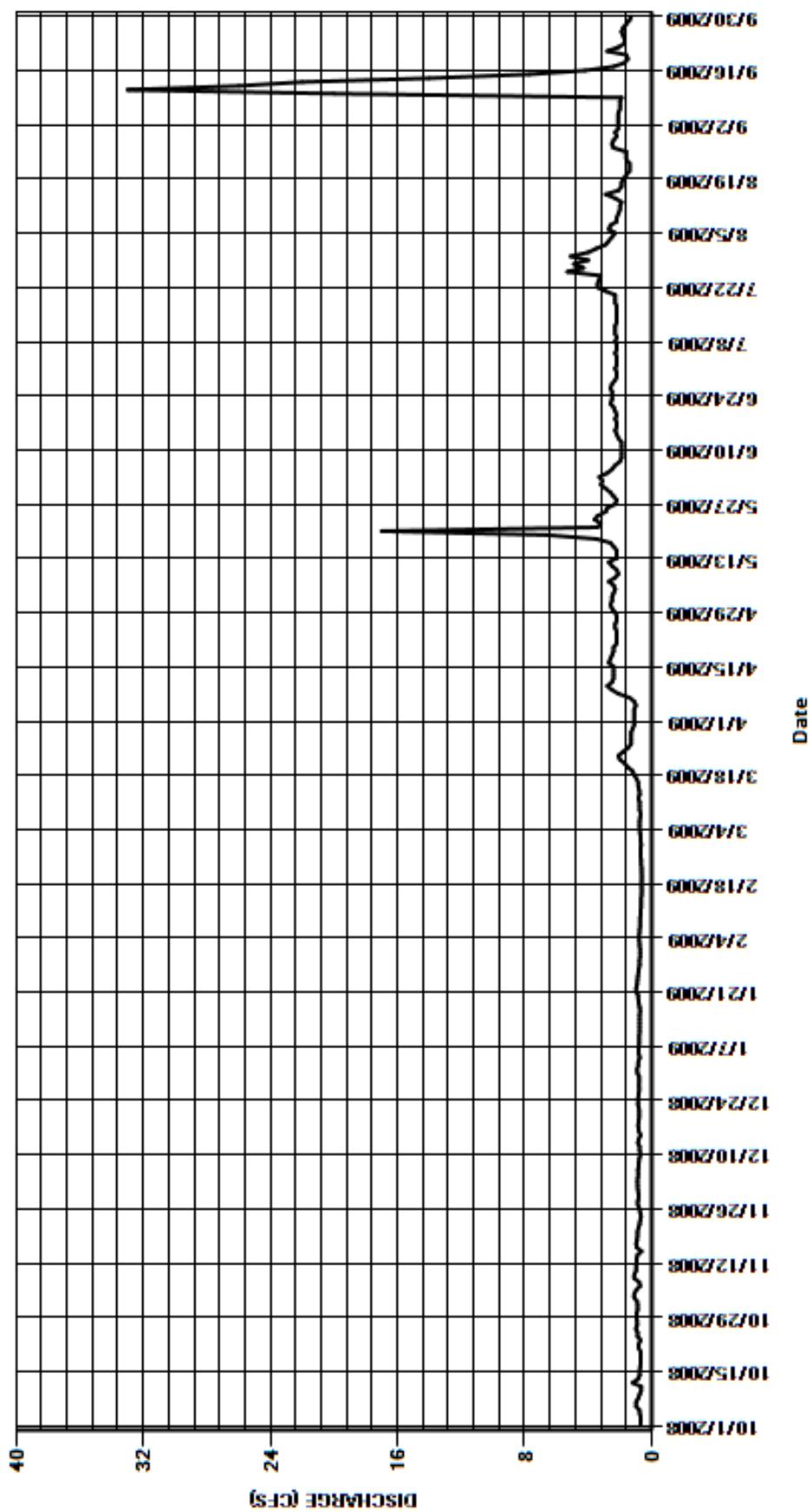
CAL YR	2008	TOTAL	1255.01	MEAN	3.43	MAX	76	MIN	0.64	AC-FT	2490
WTR YR	2009	TOTAL	714.63	MEAN	1.96	MAX	33	MIN	0.62	AC-FT	1420

MAX DISCH: 69 CFS AT 17:30 ON May. 20,2009 GH 2.45 FT. SHIFT 0.03 FT.

MAX GH: 2.45 FT. AT 17:30 ON May. 20,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077610 IVANHOE CREEK NEAR NAST
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE
Water Year 2009

Location.-- Lat. 39°14'20", Long. 106°35'24", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on right bank 300 ft downstream from diversion dam, 5.2 mi upstream from mouth, and 7.2 mi southeast of Norrie, CO.

Drainage and Period of Record.-- 11.5 mi².

Equipment.-- Station is equipped with Sutron stage discharge recorder (SDR) on rectangular platform with removable steel cover on 12" diameter corrugated metal well located directly in stream. An SDR-0001-4 was installed on Jul 21, 2009 after removing Sutron Model SDR-0001-1 stage discharge recorder and Stevens 4-20 mA shaft encoder. The SDR-0001-4 is hard-wired to Chapman Control House and configured to transmit 4-20 mA gage height via satellite. SDR is set by drop tape to a reference point (1/4 in brass bolt) on outside of downstream side of graphic recorder shelter. Control is a 6.2-ft. wide concrete weir.

Hydrographic Conditions.-- Drainage Basin is approximately 11.5 sq. mi. of National Forest land, primarily wilderness area. Transmountain diversions occur just upstream of station and are diverted to Arkansas River Basin through Charles H. Boustead Tunnel.

Gage-Height Record.-- Primary record is hourly averages of 15-minute SDR log data. The record is complete and reliable for Water Year 2009, except for Oct 1 – 8 when float was hung up and Nov 18, 2008 through Apr 10, 2009 when the gage stilling well was frozen.

Datum Corrections.-- Levels were run to the outside gage RP on Oct 8, 2008 and Jul 21, 2009. Using RM 2 as a base, the gage was found to read correct. An RP adjustment was not required.

Rating.-- Control is 6.2 ft wide sharp crested concrete weir with a 6 ft concrete apron above the crest. Rating No. 9 has been in use since May 2, 2005 and is well-defined from 5 to 115 cfs. Five discharge measurements (338-342) made during Water Year 2009, and measurement 343 made subsequently, were used for analysis. The gage stilling well was frozen at the time of measurement 339 but an accurate gage height was taped from the outside RP and a shift was calculated for the measurement. Measurements range in discharge from 4.38 to 27.2 cfs, which covered the range experienced during the period of record except for lower daily flows on Apr 10 through May 8, 2009 and higher daily flows on Jul 14-20, 31 and Aug 1, 2009. The peak gage height of 3.13 ft occurred on Jul 26, 2009 at 19:15 when a shift of +0.06 ft resulted in a maximum discharge of 45.7 cfs. The peak discharge exceeded high measurement 341 by 0.49 ft in stage.

Discharge.-- A shifting control method was used for all of Water Year 2009. Variable stage-shift curve FRYSFUCOVS10 was defined by measurements 338 – 341 and historic high measurement 297. Shifts were distributed using FRYSFUCOVS10 from Oct 1, 2008 through Aug 31, 2009 except for the days with no gage height record (Oct 1-8, 2008 and Nov 18, 2008 – Apr 10, 2009). Shifts were distributed by time from Sep 1-30. Measurements indicate raw shifts ranging from +0.01 to +0.05 ft. Measurement 338 was discounted -5% to develop the variable stage-shift relationship.

Special Computations.-- Discharge for days with no gage height record (Oct 1-8, 2008 and Nov 18, 2008 – Apr 10, 2009) were estimated by hydrographic comparison with downstream gage on Fryingpan River near Thomasville (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas Project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.

Remarks.-- Record is good, except for periods of no gage height record which are rated as poor. Station maintained by Craig Bruner. Record developed by James Kellogg.

Recommendations.-- Make site visit(s) on snow mobiles or ATVs in April and/or May (depending on avalanche hazard at mile marker 9 on road) to evaluate ice condition in channel, control, and stilling well. Look into need for different float and counterweight for SDR. Evaluate potential for a new rating that plots to the right of Rating 9.

STATE OF COLORADO
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09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE

RATING TABLE-- FRYSFUCO09 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.3	6.1	6.1	6.5	5.1	5	7.9	1.8	5.7	7.7	28	7.7
2	5.9	5.9	6.1	5.9	5.3	5	7.7	1.8	5.8	7.7	22	7.6
3	6.1	6.1	6.3	5.9	5.5	5.1	7.7	1.6	6.1	7.5	20	7.5
4	6.5	6	6.1	5.3	5.5	5.3	7.5	1.6	6	7.3	18	7.3
5	6.5	5.9	5.9	5.7	5.5	5.3	7.3	1.6	6.1	7.4	17	7.1
6	7.3	7	6.1	5.9	5.3	5.3	6.7	1.6	6.1	7.5	17	7.1
7	7.3	8.4	5.7	5.7	5.1	5.1	6	1.6	5.9	7.6	16	7
8	6.9	8.4	5.7	5.5	5.1	5	5.3	1.6	6.1	11	15	6.8
9	6.5	8.3	5.5	5.5	5.1	5.3	4.7	4.3	6.4	19	14	6.4
10	6.3	8	5	5.5	5	5.3	4	6.7	6.3	19	13	6.3
11	6.7	7.9	5.3	5.3	5	5.3	3	6.9	6.3	19	13	6.2
12	7.5	7.7	5.3	5.3	4.8	5.9	3	6.8	6.3	18	12	6.4
13	6.1	6.7	6.1	5.3	4.8	5.3	3	6.8	7.3	26	12	8.9
14	7.5	5.9	5.7	5.3	4.8	5.5	3	6.4	7.7	29	13	7.3
15	7.2	6	5	5.3	4.6	5.9	3.2	6.2	7.9	33	14	6.8
16	6.8	5.8	5.7	5.1	4.4	5.9	3.3	6.1	7.8	33	12	7
17	6.6	5.2	5.9	5.3	4.6	6.7	3.1	6.1	8	31	11	6.4
18	6.4	6.5	5.9	5.7	4.6	7.9	3.1	6.2	7.7	30	11	6.6
19	6.2	6.3	5.7	5.9	4.4	8.7	3.1	7.3	7	29	10	6.9
20	6.2	6.3	5.5	5.9	4.4	11	3.2	8.2	6.7	28	10	7.6
21	6.3	5.9	5.5	6.9	4.6	12	3.7	7.4	6.9	27	9.6	9.9
22	6.1	5.3	5.7	6.9	4.6	14	2.6	6.2	6.6	25	9.2	7.8
23	7.1	5.1	6.1	6.5	4.8	15	1.6	6.3	6.6	23	9.6	7.3
24	7.3	4.8	5.9	6.3	4.8	13	1.6	5.8	6.8	22	10	7.2
25	9.8	5.1	5.9	6.1	5	11	1.7	5	6.5	21	10	7.8
26	6.3	5.5	5.7	5.9	5	9.5	1.8	4.8	6.6	31	9.7	8.7
27	6.6	6.1	5.5	5.7	5	9.3	1.8	5.3	7.8	26	9.1	8.2
28	6.3	6.1	5.7	5.3	4.8	9.1	1.8	6.2	7.8	25	8.6	7.2
29	6.5	5.7	5.5	5.5	---	8.9	1.8	6.5	11	26	8.3	6.6
30	6.3	5.9	5.5	5.1	---	8.3	1.8	6.1	15	26	8.1	7.5
31	6.5	---	6.3	5.1	---	8.1	---	6.3	---	28	8	---
TOTAL	207.9	189.9	177.9	177.1	137.5	238.0	116.0	157.1	214.8	657.7	398.2	219.1
MEAN	6.71	6.33	5.74	5.71	4.91	7.68	3.87	5.07	7.16	21.2	12.8	7.3
AC-FT	412	377	353	351	273	472	230	312	426	1300	790	435
MAX	9.8	8.4	6.3	6.9	5.5	15	7.9	8.2	15	33	28	9.9
MIN	5.9	4.8	5	5.1	4.4	5	1.6	1.6	5.7	7.3	8	6.2

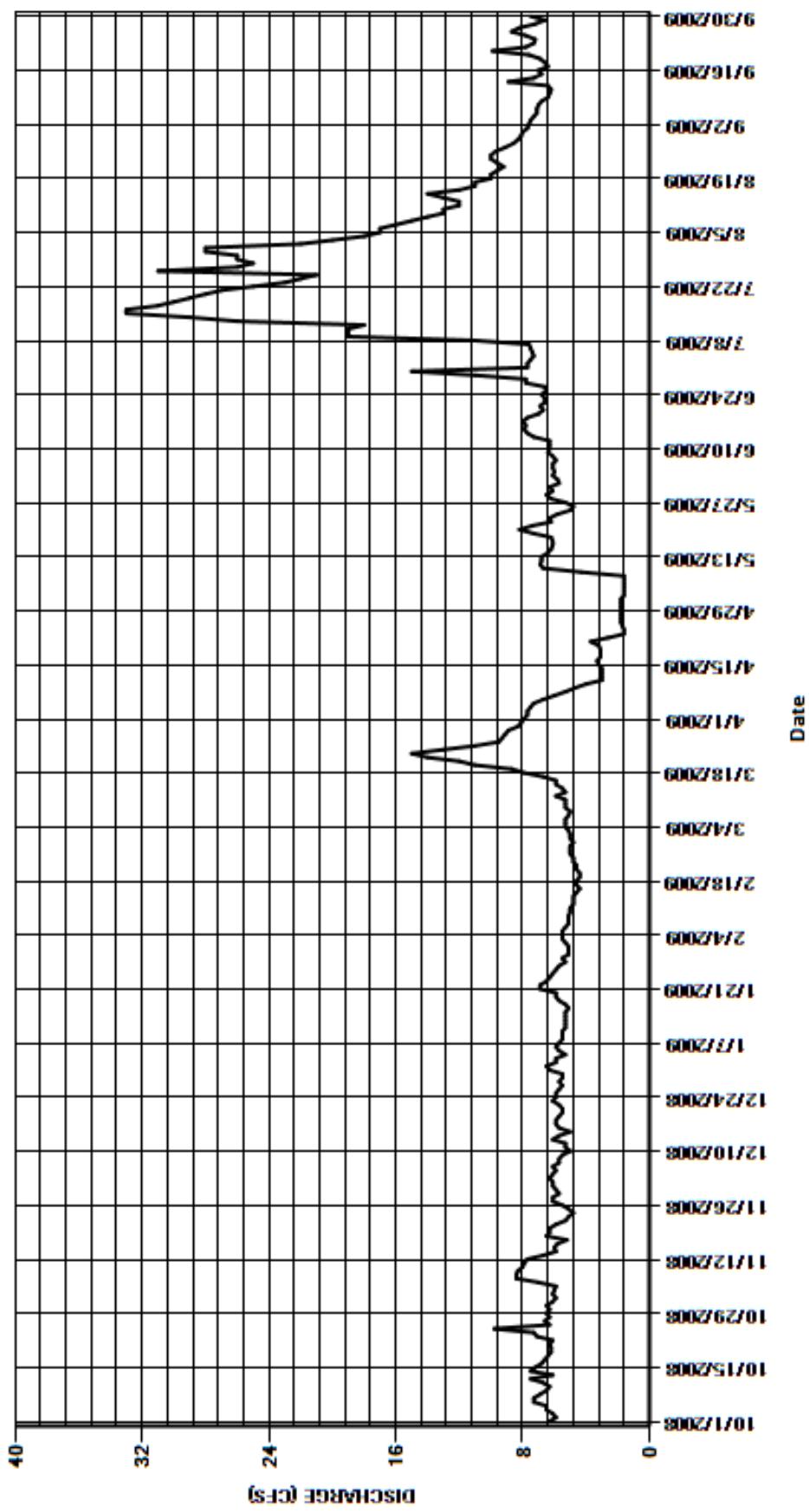
CAL YR	2008	TOTAL	2857.3	MEAN	7.81	MAX	58	MIN	1.3	AC-FT	5670
WTR YR	2009	TOTAL	2891.2	MEAN	7.92	MAX	33	MIN	1.6	AC-FT	5730

MAX DISCH: 46 CFS AT 19:15 ON Jul. 26,2009 GH 3.13 FT. SHIFT 0.06 FT.

MAX GH: 3.13 FT. AT 19:15 ON Jul. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

0907800 SOUTH FORK FRYING PAN RIVER AT UPPER STATION NEAR NORRIE
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
09077945 CHAPMAN GULCH NEAR NAST
Water Year 2009

Location.-- Lat. 39°15'51", Long. 106°37'54", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on right bank 700 ft downstream from Chapman diversion tunnel, 3.3 mi upstream from mouth, and 4.3 mi south of Norrie, CO.

Drainage and Period of Record.-- 5.99 mi².

Equipment.-- Station is equipped with a Sutron model SDR-0001-4 stage discharge recorder and a Stevens A-35 graphic water-stage recorder in 3 feet square metal-clad shelter on a 24 inch diameter corrugated metal well located directly in stream. SDR and graphic recorder are equipped with separate floats and set to an inside reference point with a drop tape. The SDR is hard-wired to Chapman Control House and configured to transmit gage height via 4-20 mA output. Control is a 120 deg v-notch sharp-crested weir (low flows) and channel (high flows).

Hydrographic Conditions.-- Basin is almost entirely roadless National Forest land. Chapman Diversion for Fryingpan-Arkansas Project is just upstream of gaging station. Hunter Tunnel discharges above the diversion. During winter, ground water seepage from the tunnel flows into the stream and keeps control and gaging station free of ice.

Gage-Height Record.-- Primary record is hourly averages of 15-minute data downloaded from SDR and chart record is used as backup. The record is complete and reliable for the entire WY 2009. Checks between the primary and backup records agreed within +/- 0.02 ft. The backup record helped identify a problem with the SDR data between Jun 13 and Jul 31. Instrumentation corrections were made to the SDR and chart recorder throughout WY 2009.

Datum Corrections.-- Levels were run to inside gage on Oct. 8, 2008. Using RM 1 as a base, the gage was found to read correct. Levels were run again on Jul. 31, 2009. Using RM 1 as a base, the gage was found to read 0.02 ft low and the RP was corrected.

Rating.-- Low water control is 120 deg v-notch weir approximately 12 ft below gage. High water control is channel banks. Rating No. 6 has been used since Oct 1, 2004 and is well defined from 3 to 120 cfs. Discharge measurements 363-371 made during WY 2009, and 372 made subsequently, were used for analysis. Measurements range from 1.50 to 10.0 cfs and cover the range experienced during the year except for lower daily flows on Feb 18-28; Mar 9-11; and Apr 2-6 and higher daily flows of May 17-18, 20-24, 30-31; Jun 19-27; and Jul 16-22, 26-31. The peak gage height of 3.89 ft occurred on May 17 at 21:00 when a shift of +0.01 ft resulted in a maximum discharge of 122 cfs. The peak gage height exceeded the highest measurement 370 by 1.66 ft in stage.

Discharge.-- Shifting section control method was used for WY 2009. Shifts were applied and distributed by time for the entire period of record. Raw shifts ranged from -0.01 ft to +0.05 ft. Measurements 363 - 368 were discounted from -3% to +7% to smooth the shift distribution. It is suspected that changing approach velocities and turbulence above the weir at various stages have a large effect on shifts.

Special Computations.-- None required for WY 2009. Intermittent discharge of water diverted from other stream basins in the collection system makes it difficult to estimate gage height from comparison with FRYTHOCO when the Fry-Ark system is operating.

Remarks.-- Record is generally good. Periods of record with calculated discharges above about 25 cfs are considered fair due to uncertainty in the upper part of Rating No. 6. Gaging station operated and record developed by James Kellogg.

Recommendations.-- Make measurements later in day during May through July and try to better define the upper end of the rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09077945 CHAPMAN GULCH NEAR NAST

RATING TABLE--

CHAGULCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	2.8	2.1	1.8	1.6	1.5	1.5	2.8	3.6	5.5	10	3.8
2	3.5	2.8	2.1	1.8	1.6	1.5	1.4	2.8	2.8	5.5	8.8	3.8
3	3.5	3	2.1	1.8	1.6	1.5	1.4	2.7	3	5.5	8.2	3.7
4	3.5	2.8	2.1	1.7	1.5	1.5	1.4	2.6	3	5.5	7.8	3.6
5	3.7	2.6	2.1	1.7	1.5	1.5	1.4	2.9	3.1	9.3	7.5	3.6
6	3.9	2.6	2.1	1.7	1.5	1.5	1.4	2.8	2.9	5.2	7.6	3.6
7	3.7	2.6	2.1	1.7	1.5	1.5	1.6	3.6	2.7	5.4	7.2	3.6
8	3.6	2.7	2.1	1.7	1.5	1.5	2	3.6	3.1	5.4	6.8	3.5
9	3.5	2.6	2.1	1.7	1.5	1.4	2.1	2.7	3	5.4	6.4	3.4
10	3.4	2.5	2	1.7	1.5	1.4	1.7	2.7	2.9	5.4	6.1	3.3
11	3.9	2.5	2	1.6	1.5	1.4	1.6	2.6	2.8	5.6	6	3.3
12	4.3	2.4	2	1.6	1.5	1.5	1.6	2.6	2.7	5.6	5.7	3.3
13	3.3	2.4	2	1.6	1.5	1.5	1.5	2.2	6.5	5.5	5.6	4.2
14	3.6	2.4	2	1.6	1.5	1.5	1.8	2.5	4.9	5.5	6.1	3.6
15	3.4	2.3	2	1.6	1.5	1.5	2.1	2.5	4.7	10	6.9	3.6
16	3.5	2.3	1.9	1.6	1.5	1.5	2.3	8.2	4.7	12	5.9	3.4
17	3.4	2.3	1.9	1.6	1.5	1.5	2.1	29	4.9	14	5.3	3.3
18	3.4	2.3	1.9	1.6	1.4	1.5	2.1	14	5.1	16	5.2	3.5
19	3.3	2.3	1.9	1.6	1.4	1.5	2	2.4	17	16	4.9	3.7
20	3.2	2.3	1.9	1.6	1.4	1.6	2.1	16	10	16	4.7	4.2
21	3.2	2.2	1.9	1.6	1.4	1.6	2.6	20	20	14	4.6	5.1
22	2.9	2.2	1.9	1.6	1.4	1.7	2.8	38	26	11	4.4	4
23	3.1	2.1	1.9	1.6	1.4	1.8	2.7	35	11	10	4.9	3.8
24	3.2	2.1	1.9	1.6	1.4	1.7	2.7	37	15	10	5.7	3.7
25	3.1	2.1	1.9	1.6	1.4	1.6	2.7	7.6	23	10	5.3	4.1
26	3.1	2.1	1.9	1.6	1.4	1.5	2.7	2.3	22	16	4.8	4.3
27	3	2.1	1.8	1.6	1.4	1.5	2.7	2.7	14	12	4.4	4
28	3.1	2.1	1.8	1.6	1.4	1.5	2.7	2.9	6	11	4.2	3.6
29	3	2.1	1.8	1.6	---	1.5	2.7	3	5.4	11	4.1	3.4
30	2.9	2.1	1.8	1.6	---	1.5	2.8	12	5.4	12	4.1	3.5
31	2.8	---	1.8	1.6	---	1.5	---	13	---	11	3.9	---
TOTAL	104.5	71.7	60.8	50.9	41.2	47.2	62.2	284.7	241.2	292.3	183.1	111.5
MEAN	3.37	2.39	1.96	1.64	1.47	1.52	2.07	9.18	8.04	9.43	5.91	3.72
AC-FT	207	142	121	101	82	94	123	565	478	580	363	221
MAX	4.3	3	2.1	1.8	1.6	1.8	2.8	38	26	16	10	5.1
MIN	2.8	2.1	1.8	1.6	1.4	1.4	1.4	2.2	2.7	5.2	3.9	3.3

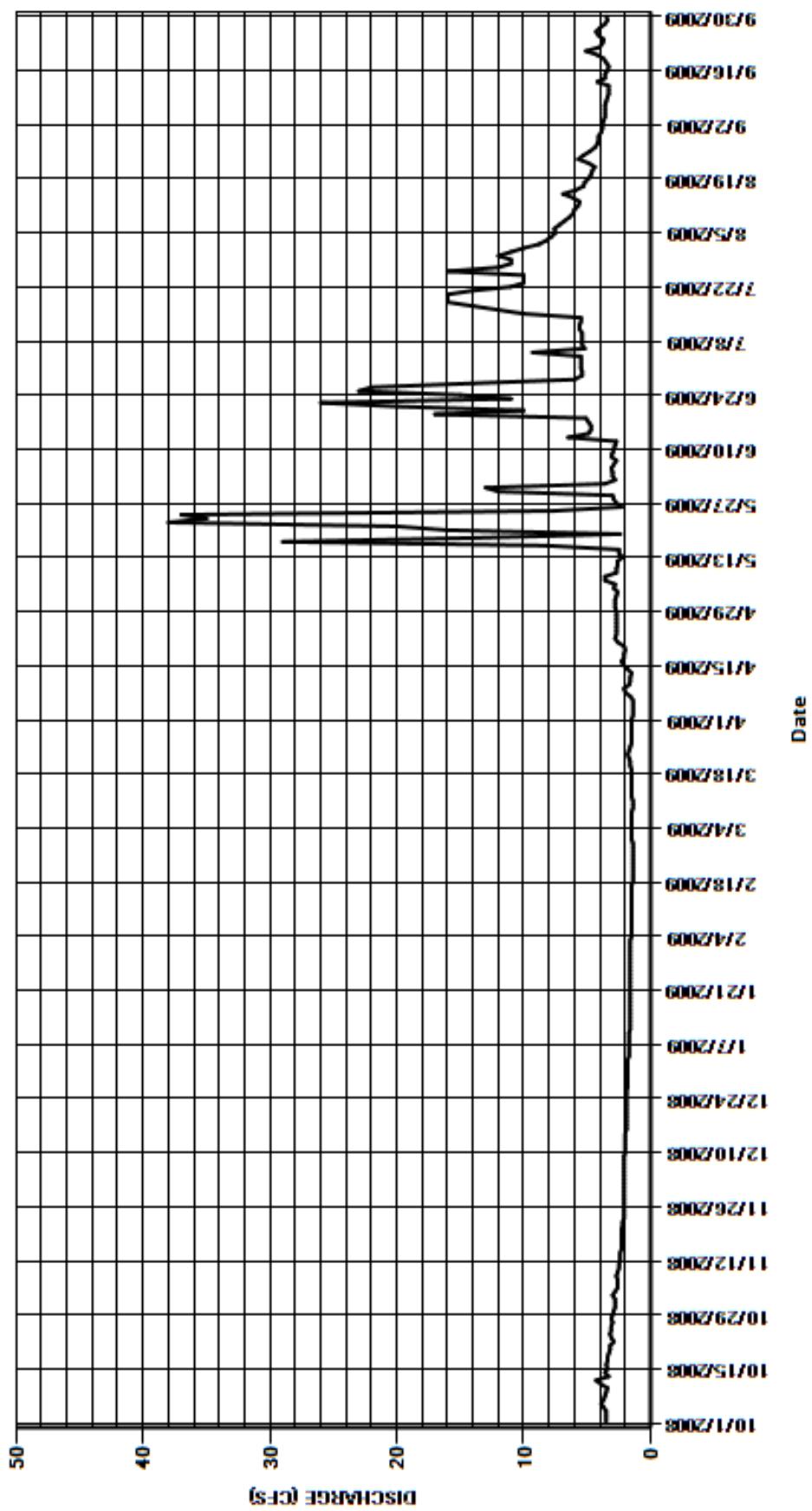
CAL YR	2008	TOTAL	1899.9	MEAN	5.19	MAX	58	MIN	1.4	AC-FT	3770
WTR YR	2009	TOTAL	1551.3	MEAN	4.25	MAX	38	MIN	1.4	AC-FT	3080

MAX DISCH: 122 CFS AT 21:00 ON May. 17,2009 GH 3.89 FT. SHIFT 0.01 FT.

MAX GH: 3.89 FT. AT 21:00 ON May. 17,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077945 CHAPMAN GULCH NEAR NAST
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE
Water Year 2009

Location.-- Lat. 39°20'34", Long. 106°39'55", in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.8 S., R.83 W., Pitkin County, Hydrologic Unit 14010004, on left bank, 800 ft upstream from bridge on county road, 0.4 mi upstream from mouth, 0.5 mi downstream from Last Chance Creek, and 1.3 mi northwest of Norrie, CO.

Drainage and Period of Record.-- 42 mi².

Equipment.-- Sutron Model 56-0540 shaft encoder and SatLink2 DCP housed in 42-in. diameter corrugated metal shelter and stilling well. A Stevens A-35 Chart Recorder was installed Nov 14, 2008. The shaft encoder and graphic recorder are equipped with separate floats and set by drop tape to an adjustable reference point on edge of recorder shelf. An air temperature sensor is mounted on exterior of shelter.

Hydrographic Conditions.-- Basin is primarily USFS land. Diversions for the Fryingpan-Arkansas Project occur in several tributaries upstream of the station. Gage well and control are frozen in winter.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite transmitted data with chart record used as a backup. The record is complete and reliable, except for the period of Nov. 22 through April 22 when the well was frozen. No flush corrections were applied. Minor instrument corrections were applied during the period of record.

Datum Corrections.-- Levels were run to inside gage on Jul 7, 2009. Using R.M. 1 as base, the gage was found to read correct and the RP was not adjusted.

Rating.-- Control is channel and large boulder 50 feet downstream of gage. Rating 10 was used for the entire year and is well defined from 3-290 cfs. Eight discharge measurements (800-807) made during WY 2009, and measurement 808 made subsequently were used for this analysis. The measurements ranged in discharge from 5.37 to 204 cfs and cover the range experienced during the year except for the higher daily flows of May 18 - 27, and June 1-4 and lower daily flows of Oct 1-22 and 31, and Sep 1-20, 29, and 30. The peak gage height of 4.48 ft occurred at 23:15 on May 18 when a shift 0.02 ft. resulted in a maximum discharge of 354 cfs. The peak gage height exceeded high measurement 805 by 0.38 ft. in stage.

Discharge.-- Shifts were distributed by time up to the period of frozen gage (Nov. 22 through Apr. 22) when no shift was applied to estimated daily discharges. Variable shift curve FRYNFNCOVS09 was used following the period of no gage height through measurement 807 on Aug 26. Shifts were distributed by time from Aug 26 to the end of the water year. Raw shifts ranged from 0.02 ft to -0.07 ft. Measurements 806 and 807 were discounted -3% to -4% to develop the variable stage shift curve. Measurements 801-803 were made during the period of frozen well.

Special Computations.-- Average Daily discharge for period of frozen well were estimated by winter ice measurements and hydrographic comparison with average daily discharge measured at the Fryingpan River near Thomasville gage.

Remarks.-- Record is good, except for periods of no gage height record which are poor. Station maintained and record developed by Craig Bruner.

Recommendations.--

STATE OF COLORADO
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09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE

RATING TABLE--

FRYNFNCO10 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.2	5.4	9.5	13	5.6	6.5	16	110	226	73	26	5.2
2	2.2	6.1	9.8	11	5.7	6.6	15	93	227	67	23	4.9
3	2.3	7.1	11	11	5.7	6.9	16	95	263	72	21	4.7
4	2.3	6.9	11	9.8	5.6	7.2	15	91	229	64	19	4.5
5	2.5	6.1	11	10	5.6	7.4	15	82	186	60	17	5.4
6	2.7	10	11	11	5.5	7.5	16	91	170	55	17	5.3
7	2.7	12	11	10	5.4	7.3	20	136	157	48	19	4.9
8	2.7	7.2	11	9.6	5.4	7.1	31	152	133	44	16	4.5
9	2.6	6.2	11	9.4	5.5	7.8	38	138	126	41	14	4.1
10	2.5	6	10	9.3	5.3	7.9	32	137	121	37	13	3.9
11	2.5	6.1	11	8.8	5.4	8	33	140	125	36	11	3.8
12	3	6.2	11	8.7	5.2	9.1	32	164	115	36	10	3.6
13	2.6	6.4	13	8.5	5.3	8.3	31	168	119	32	9.7	4.6
14	2.9	6.4	13	8.4	5.4	8.7	36	154	121	29	10	4.8
15	3	15	11	8.2	5.2	9.5	42	157	115	28	18	4.7
16	4.4	16	14	7.8	5	9.6	50	172	112	25	17	4.7
17	4.5	11	14	7.9	5.3	11	42	193	114	24	13	4.3
18	4.4	6.1	14	8.4	5.4	13	37	234	120	23	11	3.9
19	4.3	6.4	13	8.5	5.2	15	37	269	125	23	9.7	4
20	4.4	6.5	12	8.4	5.2	18	46	230	135	24	8.7	4.6
21	5.2	6.1	12	9.6	5.5	21	65	210	136	24	8	9.2
22	5	5.8	13	9.4	5.6	25	91	211	127	24	7.5	7.5
23	6.5	5.8	13	8.7	5.9	26	97	232	120	28	7.1	6.7
24	6	5.6	13	8.2	6	23	102	249	107	26	8	6.2
25	5.9	6.4	13	7.8	6.3	20	100	222	117	24	8.4	6.7
26	6	7.1	12	7.4	6.3	17	97	221	124	34	7.9	6.9
27	5.6	8.2	11	7	6.4	17	78	209	123	41	7.2	6
28	5.6	8.6	12	6.4	6.2	17	73	173	99	33	6.5	5.4
29	5.5	8.3	11	6.5	---	17	78	169	84	27	5.8	4.9
30	5.5	8.9	11	5.9	---	16	108	178	79	27	5.7	4.8
31	5.3	---	12	5.7	---	16	---	180	---	27	5.8	---
TOTAL	122.8	229.9	365.3	270.3	156.1	397.4	1489	5260	4155	1156	381.0	154.7
MEAN	3.96	7.66	11.8	8.72	5.58	12.8	49.6	170	139	37.3	12.3	5.16
AC-FT	244	456	725	536	310	788	2950	10430	8240	2290	756	307
MAX	6.5	16	14	13	6.4	26	108	269	263	73	26	9.2
MIN	2.2	5.4	9.5	5.7	5	6.5	15	82	79	23	5.7	3.6

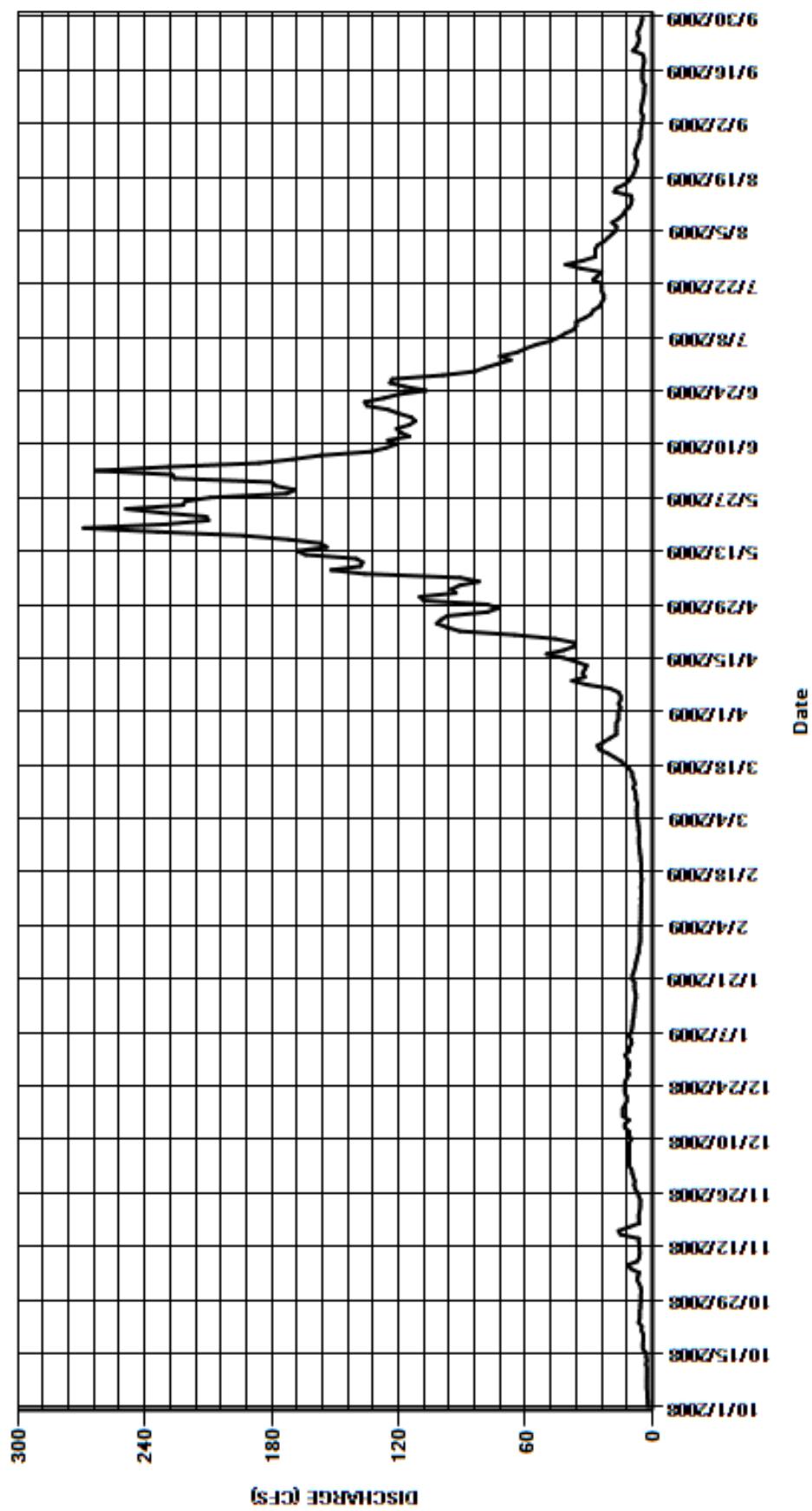
CAL YR	2008	TOTAL	17437.0	MEAN	47.6	MAX	376	MIN	2.2	AC-FT	34590
WTR YR	2009	TOTAL	14137.5	MEAN	38.7	MAX	269	MIN	2.2	AC-FT	28040

MAX DISCH: 354 CFS AT 23:15 ON May. 18,2009 GH 4.48 FT. SHIFT 0.02 FT.

MAX GH: 4.48 FT. AT 23:15 ON May. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
09078600 FRYINGPAN RIVER NEAR THOMASVILLE
Water Year 2009

Location.-- Lat. 39°20'41", Long. 106°40'23", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.8 S., R.83 W., Pitkin County, Hydrologic Unit 14010004, on right bank 400 ft upstream from private bridge, 400 ft downstream from mouth of North Fork Fryingpan River, 1.6 mi southeast of Thomasville, CO, and 1.7 mi northwest of Norrie, CO.

Drainage and Period of Record.-- 134 mi².

Equipment.-- Station is equipped with a Stevens A-35 graphic water-stage recorder and an SE 8500 shaft encoder in 42" diameter corrugated metal shelter and well. Data collection platform and satellite transmitter is a Sutron SatLink housed in external box mounted on shelter. Recorder and shaft encoder have separate floats and are set to an inside reference point with a drop tape. Stilling well is connected to stream by two 2 in diameter pipes. Control is a 100-ft. wide concrete dam 10 ft. below gage.

Hydrographic Conditions.-- Drainage basin is almost entirely National Forest land. Transmountain diversions above station occur through Boustead Tunnel and through Busk-Ivanhoe Tunnel.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data and chart record is used for backup. The record is complete and reliable for Water Year 2009, except for periods on May 7-8, 12-17 and 29-31; and June 1-4 when the shaft encoder float was hanging up. Gage heights for these periods were obtained from adjacent satellite data and comparison with chart recorder data without loss of accuracy. Checks between the primary and backup records agreed to within +/- 0.02 ft. A flush correction was applied on Jul 6 and 7. The gage heights during this period were graphically determined from chart data. Several shaft encoder corrections were applied during the period of record.

Datum Corrections.-- Levels were run to inside gage on Aug 25, 2009. Using RM 1 as a base, the gage was found to read correct. An RP adjustment was not required.

Rating.-- Control is a 103 ft long concrete weir. Rating No. 3 (developed Nov 18, 2008) was used for the entire Water Year 2009. The new rating is well defined from 20 to 1000 cfs. Discharge measurements 396-403 made during WY 2009, and 404 made subsequently, were used for analysis. Measurements range from 27.7 to 398 cfs, which covered the range experienced during the year except for lower daily flows on Nov 6, 15, 22-25; Dec 10-12 and 15; Jan 4, 11-17, 28 and 30-31; Feb 1-2 and 6-28; and Mar 1-11 and 13 and the higher daily flows of May 18-27 and 31; and Jun 1-4. The peak gage height of 3.62 ft occurred on May 19 at 01:30 when shift of -0.03 ft resulted in a maximum discharge of 734 cfs. The peak gage height exceeded high measurement 401 by 0.51 ft in stage.

Discharge.-- A shifting control method was used for the entire water year. Shifts distributed by time for the period of record. Raw shifts ranged from -0.03 to +0.04 ft. Measurements 396-398 and 402-403 were discounted -3% to +7% to smooth the shift distribution.

Special Computations.-- None.

Remarks.-- Record is good. Station operated and record developed by James Kellogg.

Recommendations.-- Bank-operated cableway needs a winch to aid with equipment stream crossing. Cableway is due for inspection.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09078600 FRYINGPAN RIVER NEAR THOMASVILLE

RATING TABLE--

FRYTHOCO03 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

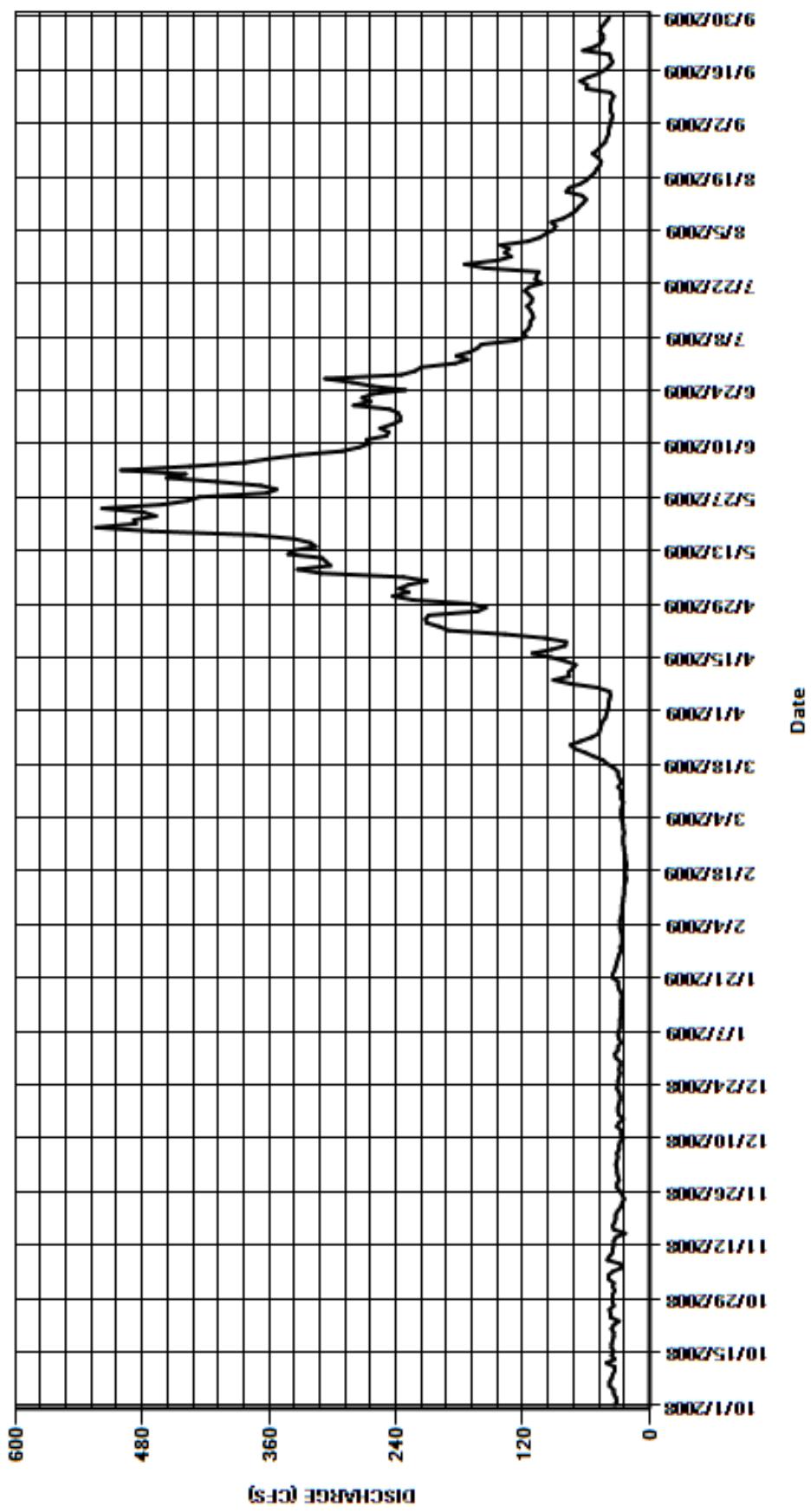
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	35	31	33	26	25	40	243	457	184	141	38
2	31	34	31	30	27	25	39	228	439	172	115	37
3	32	39	32	30	28	26	39	237	500	183	104	36
4	34	39	31	27	28	27	38	228	435	170	98	35
5	34	35	30	29	28	27	37	211	383	163	91	37
6	38	26	31	30	27	27	38	233	360	159	89	37
7	38	28	29	29	26	26	49	311	332	127	93	37
8	36	40	29	28	26	25	74	333	291	117	82	36
9	35	38	28	28	26	27	91	302	275	119	75	34
10	33	35	25	28	25	27	76	306	265	115	70	37
11	33	35	27	27	25	27	77	310	268	113	67	60
12	41	34	27	27	24	30	73	342	249	113	63	59
13	33	34	31	27	24	27	70	336	247	110	60	66
14	36	32	29	27	24	28	80	316	255	111	64	58
15	34	23	25	27	23	30	94	321	244	113	79	48
16	36	34	29	26	22	30	111	336	236	116	76	42
17	36	35	30	27	23	34	93	372	236	112	66	38
18	35	33	30	29	23	40	80	471	238	111	60	35
19	34	32	29	30	22	44	79	524	246	114	56	37
20	34	32	28	30	22	53	99	486	280	118	52	38
21	36	30	28	35	23	61	137	488	264	114	50	63
22	34	27	29	35	23	71	190	467	272	102	47	52
23	29	26	31	33	24	75	199	479	262	108	46	46
24	37	24	30	32	24	65	211	518	231	107	49	44
25	37	26	30	31	25	55	212	461	262	105	54	44
26	38	28	29	30	25	48	209	437	281	156	49	47
27	34	31	28	29	25	47	163	426	307	175	46	46
28	35	31	29	27	24	46	155	362	235	144	42	43
29	35	29	28	28	---	45	169	353	222	131	41	40
30	35	30	28	26	---	42	224	368	216	137	39	38
31	33	---	32	26	---	41	---	410	---	133	39	---
TOTAL	1079	955	904	901	692	1201	3246	11215	8788	4052	2103	1308
MEAN	34.8	31.8	29.2	29.1	24.7	38.7	108	362	293	131	67.8	43.6
AC-FT	2140	1890	1790	1790	1370	2380	6440	22240	17430	8040	4170	2590
MAX	41	40	32	35	28	75	224	524	500	184	141	66
MIN	29	23	25	26	22	25	37	211	216	102	39	34
CAL YR	2008	TOTAL	46148	MEAN	126	MAX	815	MIN	23	AC-FT	91530	
WTR YR	2009	TOTAL	36444	MEAN	99.8	MAX	524	MIN	22	AC-FT	72290	

MAX DISCH: 734 CFS AT 01:30 ON May. 19,2009 GH 3.62 FT. SHIFT -0.03 FT.

MAX GH: 3.62 FT. AT 01:30 ON May. 19,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09078600 FRYINGPAN RIVER NEAR THOMASVILLE
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
09080100 FRYINGPAN RIVER AT MEREDITH
Water Year 2009

Location.-- Lat. 39°21'45", Long. 106°43'55", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, T.8 S., R.84 W., Eagle County, Hydrologic Unit 14010004, on left bank at Meredith, CO, 0.1 mi downstream from Waterbury Creek, 0.7 mi downstream from Jakeman Gulch.

Drainage and Period of Record.-- 191 mi².

Equipment.-- Station is equipped with a Stevens A-35 graphic water stage recorder, a Sutron SatLink2 data collection platform (DCP), and a Model 56-0540 Sutron shaft encoder in a standard 42" corrugated metal shelter and well. Recorder and shaft encoder have separate floats and are set to an inside reference point with a drop tape.

Hydrographic Conditions.-- Low water control is a riffle approximately 80 ft. below the gage house. High water controls are channel banks. Transmountain diversions above station occur through the Boustead and Busk-Ivanhoe Tunnels.

Gage-Height Record.-- The primary record is hourly averages of 15 minute satellite data. Chart record is used for backup. The record is complete and reliable, except for the period of no gage height: Dec 15, 2008 through Apr 28, 2009 when the well was frozen. A flush correction was applied on Dec 10, 2008. Shaft encoder corrections were applied throughout the period of record.

Datum Corrections.-- Levels were run on July 10, 2009 to the RP index using R.M. 1 as base. The RP index was found to be -0.006 feet low. No corrections were made since the RP was found to be within the allowable error tolerances.

Rating.-- Rating 4, in use since October 1, 1984, was used all water year. It is well defined from 25 to 1000 cfs. Discharge measurements 418-424 made during the water year, and measurement 425 made subsequently, were used for analysis. The measurements ranged from 34.2 to 543 cfs. They cover the range experienced except for the higher daily flows of May 13, 16-31, and June 1-7; and the lower daily flows of Nov 15, Dec 9, and Feb 15-22. The peak gage height of 4.21 ft occurred at 02:30 on May 19, 2009 when a shift of 0.08 ft resulted in a maximum discharge of 1090 cfs. The peak gage height exceeded high measurement 422 by 0.83 ft in stage.

Discharge.-- Shifts were distributed by time from the beginning of the water year up to the period of frozen well. A stage-shift relationship was used through the period of run-off until Jul 10, 2009. Shifts were then distributed by time through the remainder of the water year. Measurements made this year indicate raw shifts ranging from -0.05 ft to +0.03 ft. Measurements 418, 424, and 425 were discounted from -7% to +1% to better fit the stage-shift relationship. Measurements 421 and 423 were discounted +1% to +3% to smooth the shift distribution. Measurements 419 and 420 were made during the period of frozen well (no gage height).

Special Computations.-- Discharge for the period of frozen well was estimated from winter ice measurements and hydrographic comparison with hourly discharge at the FRYTHOCO Fryingpan River near Thomasville (FRYTHOCO) gage.

Remarks.-- Record is good, except for period of no gage height, which is considered poor. Station maintained and record developed by Craig Bruner

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09080100 FRYINGPAN RIVER AT MEREDITH

RATING TABLE--

FRYMERCO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

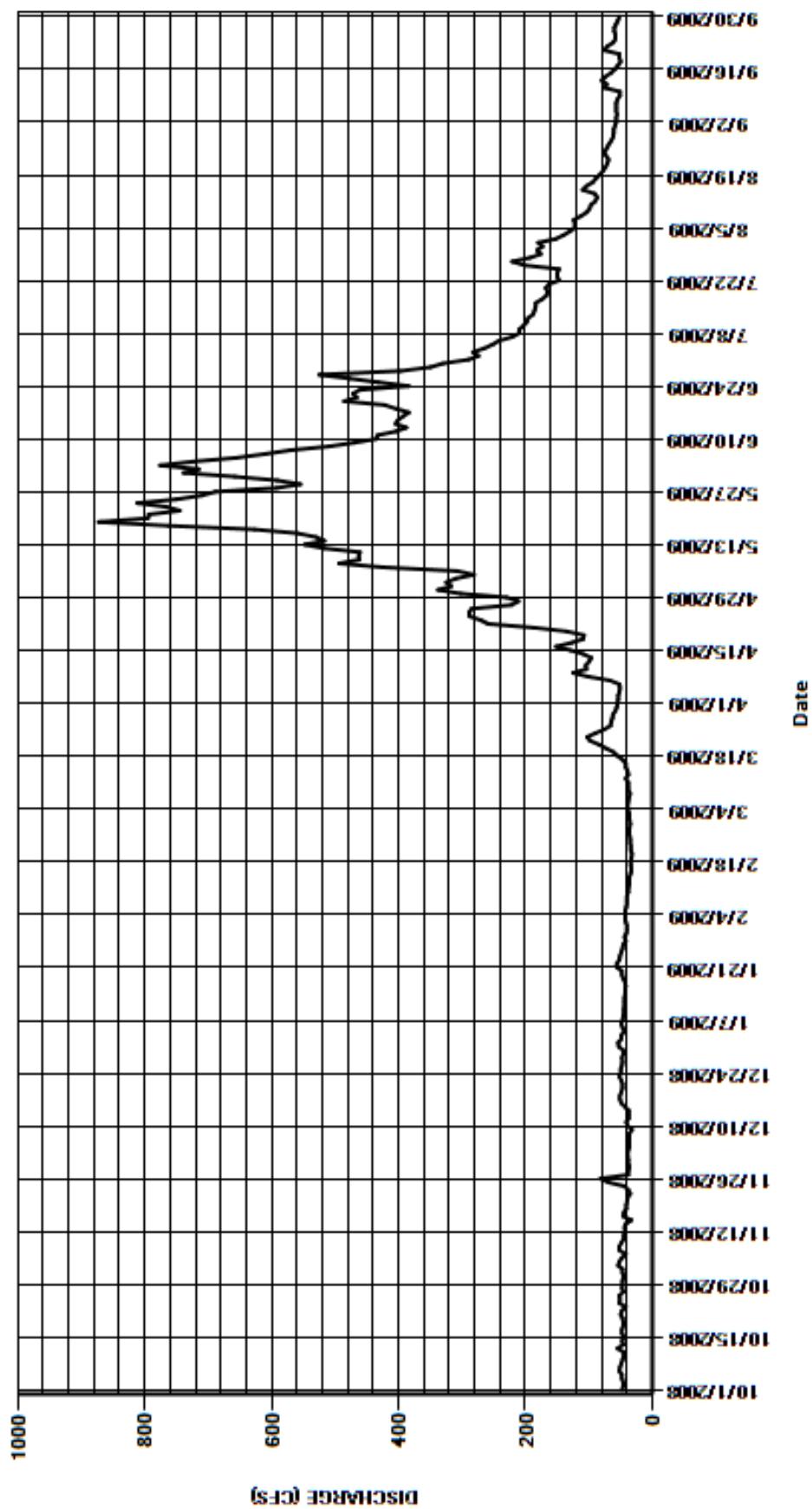
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	47	38	54	40	36	55	338	739	290	180	59
2	46	47	39	49	42	36	54	317	715	274	152	57
3	46	54	39	49	43	37	54	325	776	283	140	57
4	48	52	37	44	43	39	52	310	724	265	130	56
5	48	48	36	47	43	39	51	281	656	252	122	57
6	52	42	37	49	41	38	52	308	611	242	122	57
7	51	52	36	47	40	37	67	425	571	221	124	57
8	49	52	36	46	40	35	101	494	510	210	113	55
9	47	49	32	45	40	38	125	462	470	210	104	51
10	45	45	39	45	38	38	104	463	435	203	99	51
11	45	45	41	44	38	38	105	461	433	198	97	75
12	55	43	37	44	36	42	100	517	404	196	90	72
13	46	44	37	44	36	38	96	548	388	188	87	80
14	48	42	37	43	36	39	109	517	405	186	91	74
15	45	33	43	43	34	42	129	530	401	184	110	65
16	48	46	49	42	33	42	152	560	393	184	104	59
17	48	45	51	43	34	47	127	627	384	174	94	54
18	46	41	51	46	34	55	109	763	404	167	89	50
19	46	41	49	48	33	61	108	873	422	165	83	52
20	47	40	47	48	32	73	135	795	486	168	78	52
21	50	39	47	56	34	84	187	794	466	163	74	77
22	48	35	49	56	34	98	259	745	472	147	71	71
23	42	38	52	52	35	103	271	766	461	150	69	62
24	52	44	50	51	35	90	288	812	384	150	73	58
25	51	69	50	49	36	76	289	750	432	147	76	58
26	52	82	48	47	36	66	285	711	477	201	72	60
27	46	38	47	46	36	65	222	689	525	221	69	60
28	48	38	48	42	35	63	211	592	397	193	65	57
29	47	36	46	44	---	62	230	555	350	176	62	54
30	47	38	46	41	---	58	302	591	330	182	61	52
31	45	---	53	40	---	56	---	658	---	173	61	---
TOTAL	1482	1365	1347	1444	1037	1671	4429	17577	14621	6163	2962	1799
MEAN	47.8	45.5	43.5	46.6	37	53.9	148	567	487	199	95.5	60
AC-FT	2940	2710	2670	2860	2060	3310	8780	34860	29000	12220	5880	3570
MAX	55	82	53	56	43	103	302	873	776	290	180	80
MIN	42	33	32	40	32	35	51	281	330	147	61	50
CAL YR	2008	TOTAL	65363	MEAN	179	MAX	1200	MIN	30	AC-FT	129600	
WTR YR	2009	TOTAL	55897	MEAN	153	MAX	873	MIN	32	AC-FT	110900	

MAX DISCH: 1090 CFS AT 02:30 ON May. 19,2009 GH 4.21 FT. SHIFT 0.08 FT.
MAX GH: 4.21 FT. AT 02:30 ON May. 19,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**09080100 FRYINGPAN RIVER AT MEREDITH
WY2009 HYDROGRAPH**



ROARING FORK RIVER BASIN
09080300 ROCKY FORK CREEK NEAR MEREDITH
Water Year 2009

Location.--	Lat. 39°21'42", Long. 106°49'12", in NW 1/4 NW 1/4 sec. 18, T.8 S., R.84 W., Pitkin County, Hydrologic Unit 14010004 on right bank at upstream end of flume constructed to carry Rocky Fork Creek across spillway to auxiliary outlet of Ruedi Dam on Fryingpan River and 4.6 mi west of Meredith, CO.
Drainage and Period of Record.--	12.3 mi ² .
Equipment.--	Station is equipped with a Stevens A-35 graphic water-stage recorder and shaft encoder (connected to recorder wheel by chain) in 42" diameter corrugated metal shelter and well located directly in stream above control. Shaft encoder is hardwired to DCP in control house on Ruedi Dam, allowing satellite transmission. Satellite monitoring equipment owned and maintained by USBR. Recorder and shaft encoder are set by drop tape to an inside adjustable reference point on equipment shelf. Control is a 38 ft. wide v-notch, sharp crested weir adjacent to gage house.
Hydrographic Conditions.--	Basin is entirely USFS land and there is no development or roads except for trailhead parking 1/4 mile above station. There are no diversions above station. Discharge from gage is subtracted from downstream USGS gage FRYRUDCO to calculate Ruedi Reservoir releases.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data and chart record is used for backup. The record is complete and reliable, except for the periods when beaver dams caused backwater behind the control (Oct 17-27 and Aug 24-Sep 1) and the period of no gage height due to frozen well from Dec 14 through Mar 05. Checks between the primary and backup records agreed to within +/- 0.02 ft. Several shaft encoder corrections were applied during the period of record.
Datum Corrections.--	Levels were run to inside R.P. on Sep 01, 2009. Using RM 1 as a base, the gage was found to read 0.02 ft low (RP was found to be +0.02 ft. high) and an RP adjustment of -0.02 ft was made. The tape was also found to be 0.01 ft too long, but the tape was not corrected until Oct 23 of WY 2010. The R.P. correction was applied as a datum correction from the end of winter ice (Mar 5) until the correction was made at 13:30 on Sep 1. The tape length error (-0.01) was applied as a datum correction from Sep 1 at 14:00 through the end of the water year.
Rating.--	Control is a 38 ft. wide v-notch, sharp crested weir adjacent to gage house. Rating 2 was used for the entire water year and has been in place since November 11, 2004. Discharge measurements 79-86 made during WY 2009, and measurement 87 made subsequently, were used for analysis. Measurements ranged from 2.25 to 28.3 cfs and covered the annual range of flows except for the lower daily flows of Jan 28-31, Feb 1-28, and Mar 1-9; and the higher daily flows of May 9-31 and June 1-28. The maximum gage height of 1.47 ft. occurred on May 24 at 22:00 when a shift of +0.04 ft and a datum correction of 0.02 ft resulted in a maximum discharge of 73.6 cfs. The maximum gage height exceeded the stage of high Measurement 84 by 0.39 feet.
Discharge.--	A shifting section control method was used for the water year. Shifts were prorated by time from Oct 1, 2008 until 12:15 on Mar 18, 2009. Shifts were distributed using variable shift curve RFCMERC0VS09 from 13:00 on Mar 18 until 13:30 Sep 1. Shifts were pro-rated by time from 14:00 Sep 1 through the end of WY 2009. Measurement 84 and 86 were discounted -4% and -3% respectively to fit historical stage-shift trends. Measurements 80 and 81 were made during the ice period when no gage height was available.
Special Computations.--	Beaver dams caused backwater behind the control Oct 17-27 and Aug 24-Sep 1. Gage height during these periods was graphically estimated from chart data. Discharge during period of no gage height was estimated by proration between good gage height data and measurements made during frozen well period. A comparison with discharge data from downstream USGS gage FRYRUDCO has limited use for estimating due to reservoir releases between the USGS gage and the subject gage.
Remarks.--	Record is good, except for days with estimated gage height during backwater which are rated as fair and days with estimated discharge during frozen well conditions which are rated as poor. Station maintained and record developed by Craig Bruner.
Recommendations.--	Upper end of stage-discharge relationship should be evaluated and possibly redefined in WY2010.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09080300 ROCKY FORK CREEK NEAR MEREDITH

RATING TABLE--

RFCMERC002 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.8	3.3	2.5	2.6	2.2	2.2	3.5	13	56	23	8.1	4.4
2	3.7	3.3	2.5	2.6	2.2	2.2	3.5	15	59	22	8	4
3	3.5	3.4	2.5	2.6	2.2	2.2	3.5	17	69	22	7.8	3.9
4	3.5	3.4	2.5	2.5	2.2	2.2	3.4	18	71	20	7.5	3.8
5	3.5	3.5	2.5	2.5	2.2	2.2	3.5	18	68	20	7.3	3.8
6	3.6	3.5	2.5	2.5	2.2	2.3	3.6	16	63	18	7.1	3.8
7	3.5	3.5	2.5	2.5	2.2	2.3	3.9	18	57	17	6.9	3.8
8	3.5	3.3	2.5	2.5	2.2	2.3	4.4	25	53	15	6.8	3.8
9	3.5	3.1	2.5	2.5	2.2	2.4	4.5	29	49	15	6.7	3.8
10	3.5	2.9	2.5	2.5	2.2	2.4	4.5	29	46	14	6.5	3.8
11	3.5	2.8	2.5	2.5	2.2	2.4	5.3	32	45	13	6.4	3.6
12	3.4	2.9	2.5	2.4	2.2	2.5	5.6	36	42	13	6.4	3.4
13	3.3	3	2.5	2.4	2.2	2.5	5.9	40	40	13	6.4	3.3
14	3.5	3	2.6	2.4	2.2	2.5	6.3	39	39	12	6.9	3.5
15	3.3	2.9	2.7	2.4	2.2	2.5	7	39	38	12	6.9	3.5
16	3.3	2.8	2.8	2.4	2.2	2.7	7.2	41	37	11	7.6	3.5
17	3.3	2.8	2.8	2.4	2.2	2.9	6.7	46	36	11	6.1	3.6
18	3.3	2.7	2.7	2.4	2.2	3	6.7	51	35	10	6.4	3.6
19	3.3	2.7	2.7	2.4	2.2	3.1	7	57	35	9.9	6	3.5
20	3.3	2.7	2.7	2.3	2.2	3.4	7.5	56	35	9.5	6.3	3.8
21	3.3	2.7	2.7	2.3	2.2	3.6	8.1	56	35	9.4	8.4	3.8
22	3.1	2.7	2.7	2.3	2.2	4.1	8.5	58	33	9	7.4	3.9
23	3.1	2.7	2.7	2.3	2.2	4.3	8.9	60	32	8.7	6.9	4
24	3.1	2.7	2.7	2.3	2.2	4	10	68	30	8.5	7	4
25	3	2.7	2.7	2.3	2.2	4	12	69	31	8.4	6.7	4
26	3	2.6	2.6	2.3	2.2	4	13	67	35	8.5	6.4	4
27	3	2.5	2.6	2.3	2.2	4	14	66	33	8.6	6.1	4
28	3.4	2.5	2.6	2.3	2.2	4	13	61	29	8.3	5.6	3.9
29	3.6	2.5	2.6	2.3	---	4	13	56	27	8.3	5.4	3.7
30	3.5	2.5	2.6	2.3	---	3.9	12	54	25	8.2	5.1	3.5
31	3.3	---	2.6	2.2	---	3.7	---	53	---	8.1	4.9	---
TOTAL	104.5	87.6	80.6	74.5	61.6	93.8	216.0	1303	1283	394.4	208.0	113.0
MEAN	3.37	2.92	2.6	2.4	2.2	3.03	7.2	42	42.8	12.7	6.71	3.77
AC-FT	207	174	160	148	122	186	428	2580	2540	782	413	224
MAX	3.8	3.5	2.8	2.6	2.2	4.3	14	69	71	23	8.4	4.4
MIN	3	2.5	2.5	2.2	2.2	2.2	3.4	13	25	8.1	4.9	3.3

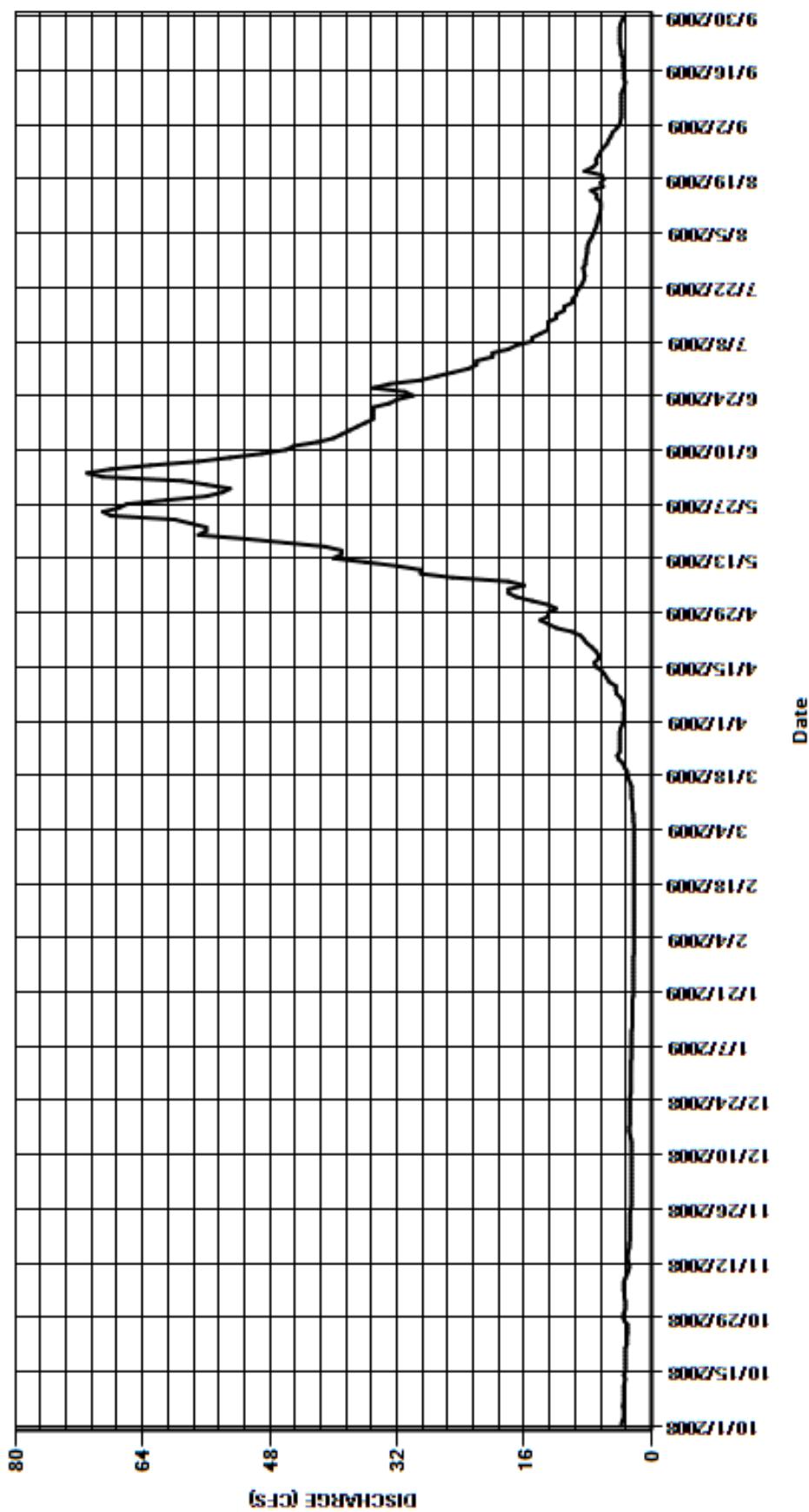
CAL YR	2008	TOTAL	4555.9	MEAN	12.4	MAX	88	MIN	1.7	AC-FT	9040
WTR YR	2009	TOTAL	4020.0	MEAN	11	MAX	71	MIN	2.2	AC-FT	7970

MAX DISCH: 74 CFS AT 22:00 ON May. 24,2009 GH 1.47 FT. SHIFT 0.04 FT. (GH CORR. +0.02 FT.)

MAX GH: 1.47 FT. AT 22:00 ON May. 24,2009 (GH CORR. +0.02 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09080300 ROCKY FORK CREEK NEAR MEREDITH
WY2009 HYDROGRAPH



ROARING FORK RIVER BASIN
CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE
Water Year 2009

Location.--	Lat 39° 22'38", long 107° 12'17" in SW1/4 NE1/4 Sec. 10, T8S, R88W in Garfield County. Located on right bank of Crystal River, at upstream side of County Road 118 bridge, and 0.75 mi. below confluence with Prince Creek.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Model 5600 AccuBubble sensor and Sutron SatLink 2 data collection platform (DCP) housed in 2 ft rectangular steel shelter. The AccuBubble orifice pipe is below the upstream side of County Road 118 bridge. The AccuBubble is set to a wire weight gage (installed and calibrated in Oct 2008) on the upstream side of the bridge. The muffler was removed from the orifice pipe in May 2008 to reduce problems with clogging. High stage flows can wash out the bubbler orifice pipe or clog the tubing. Repairs at high flows involve installation of a shorter pipe length. This can result in the bubbler orifice out of water as high flows recede in later weeks and months.
Hydrographic Conditions.--	Drainage basin is the Crystal River basin. The stream banks are moderate to steep sloping with exposed boulders along the lower portions. Control is rock and cobble channel at all stages, with channel banks becoming part of the control at higher stages. Seasonal diversions occur upstream and downstream of station.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data. DCP log is used as backup. The record is complete for the six month period of operation (Apr 1 – Sep 30). The record is reliable except for May 8-14 when the bubbler tubing was clogged and Jul 16-23 and Aug 17-Sep 9 when the bubbler pipe was above the water surface. The orifice was lowered below the water surface on Jul 23 and Sep 9. Several instrument corrections were made to the sensor during the period of record.
Datum Corrections.--	Levels were run on Oct 14, 2008. Using RM 1 as a base, the wire weight gage was calibrated and reference marks RM 4 and RM 5 were established.
Rating.--	Control is rock and cobble channel at all stages, with channel banks becoming part of the control at higher stages. Rating No. 6 was developed from measurement Nos. 4–23. The rating is fairly well defined from about 15 cfs to 3000 cfs. Six discharge measurements (Nos. 18-23) made during WY 2009 were used for analysis. The measurements used for analysis ranged in discharge from 14.4 cfs to 2470 cfs and cover the range of discharge experienced during the period of record, except for the lower daily flows on Sep 10-14 and the higher daily flows on May 18-21, 24-25 and Jun 26, 2009. The peak gage height of 7.98 ft (gage height correction of +0.01 ft applied) occurred on May 25 at 01:45 when a shift of -0.05 ft resulted in a maximum discharge of 3360 cfs. The peak gage height exceeded high measurement 19 by 0.56 ft in stage.
Discharge.--	Shifting control method was used for WY 2009. The shifts were applied by stage using variable stage-shift relationship CRYDOWCOVS10 (based on Measurement Nos. 18-19 and 21-23) for the entire period of record (Apr 1 through Sep 30). Raw shifts ranged from -0.05 to +0.04 ft. Measurements 18 and 21-23 were discounted from -3% to +6% to develop the variable stage-shift relationship. Measurement No. 20 was considered unrepresentative of actual conditions and not used to develop the discharge record.
Special Computations.--	Periods of estimated flows (May 8-14, Jul 16-23, and Aug 17-Sep 9, 2009) were developed using a hydrographic comparison with the streamflow record for upstream USGS gaging station on Crystal River above Avalanche Creek (CRYAVACO).
Remarks.--	Record is good, except for periods of estimated daily discharge, which are fair. Gaging station operated and maintained by James Kellogg. Discharge record developed by James Kellogg.
Recommendations.--	Run levels in late March 2010.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE

RATING TABLE--

CRYDOWCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	127	978	2140	1720	179	26
2	---	---	---	---	---	---	117	948	1860	1620	164	24
3	---	---	---	---	---	---	127	919	1950	1700	155	22
4	---	---	---	---	---	---	129	842	2010	1600	142	21
5	---	---	---	---	---	---	117	744	2070	1460	126	20
6	---	---	---	---	---	---	114	825	1920	1360	120	19
7	---	---	---	---	---	---	133	1160	1670	1290	138	18
8	---	---	---	---	---	---	190	1430	1440	1230	137	17
9	---	---	---	---	---	---	238	1440	1410	1170	126	15
10	---	---	---	---	---	---	214	1470	1330	1080	117	15
11	---	---	---	---	---	---	271	1700	1350	1040	101	13
12	---	---	---	---	---	---	240	1920	1260	1020	89	9.7
13	---	---	---	---	---	---	234	1890	1270	964	75	9.6
14	---	---	---	---	---	---	264	1900	1420	884	73	10
15	---	---	---	---	---	---	288	1930	1510	818	83	19
16	---	---	---	---	---	---	312	2060	1620	694	70	121
17	---	---	---	---	---	---	265	2280	1700	632	62	80
18	---	---	---	---	---	---	238	2590	1880	563	57	56
19	---	---	---	---	---	---	244	2800	1900	509	53	47
20	---	---	---	---	---	---	319	2670	2000	435	51	49
21	---	---	---	---	---	---	478	2630	1920	387	48	58
22	---	---	---	---	---	---	661	2420	1990	333	45	59
23	---	---	---	---	---	---	756	2300	2160	285	44	54
24	---	---	---	---	---	---	842	2850	2110	244	43	53
25	---	---	---	---	---	---	819	2760	2260	231	41	57
26	---	---	---	---	---	---	775	2130	2490	288	38	60
27	---	---	---	---	---	---	614	1850	2320	292	35	65
28	---	---	---	---	---	---	534	1880	2130	236	33	60
29	---	---	---	---	---	---	594	2090	1980	210	31	48
30	---	---	---	---	---	---	839	2210	1810	203	29	39
31	---	---	---	---	---	---	---	2300	---	189	28	---
TOTAL	---	---	---	---	---	---	11093	57916	54880	24687	2533	1164.3
MEAN	---	---	---	---	---	---	370	1868	1829	796	81.7	38.8
AC-FT	---	---	---	---	---	---	22000	114900	108900	48970	5020	2310
MAX	---	---	---	---	---	---	842	2850	2490	1720	179	121
MIN	---	---	---	---	---	---	114	744	1260	189	28	9.6

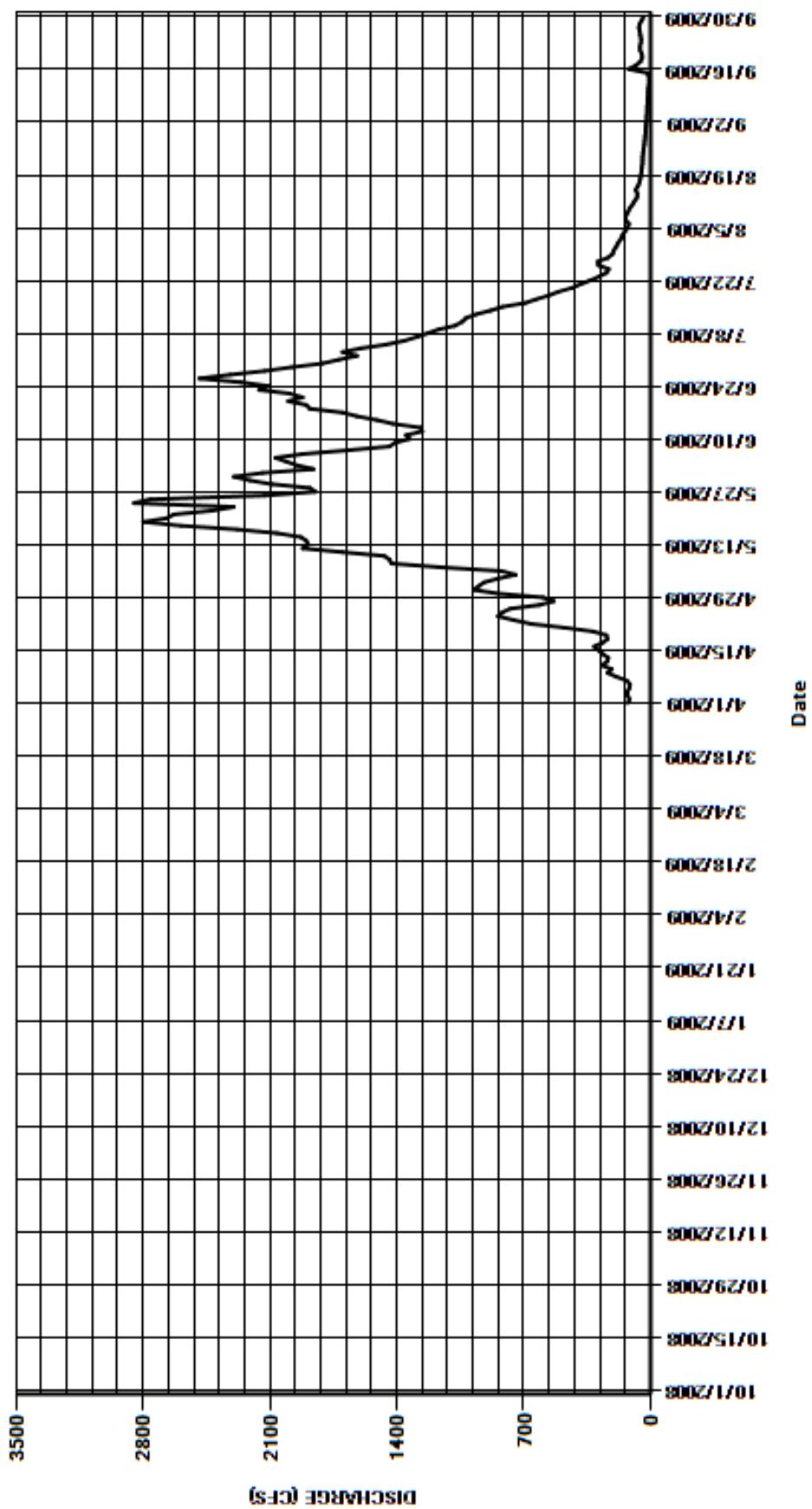
CAL YR	2008	TOTAL	171834	MEAN	939	MAX	3650	MIN	61	AC-FT	340800	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	152273.3	MEAN	832	MAX	2850	MIN	9.6	AC-FT	302000	(PARTIAL YEAR RECORD)

MAX DISCH: 3360 CFS AT 01:45 ON May. 25,2009 GH 7.98 FT. SHIFT -0.05 FT. (GH CORR. 0.01 FT. APPLIED)

MAX GH: 7.98 FT. AT 01:45 ON May. 25,2009 (GH CORR. 0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE
WY2009 HYDROGRAPH



09089500 WEST DIVIDE CREEK NEAR RAVEN

Water Year 2009

Location.--	Lat 39° 19'52", long 107° 34'46" in NE1/4 SW1/4 Sec. 29, T8S, R91W, Hydrologic Unit 14010004 in Mesa County. Station is on left bank about 5 ft downstream of private road bridge, 0.8 mi upstream of Brook Creek, 8 mi south of Raven, and 16 mi south of Silt.
Drainage and Period of Record.--	64.6 sq mi. October 1955 to September 1999. Beginning October 1999, station operated seasonally by USGS. Seasonal operation of gage by Colorado Division of Water Resources began in November 2005. Gage at same site and datum since establishment.
Equipment.--	Model 5600 AccuBubble sensor in corrugated metal shelter on 42" diameter stilling well. Data collection platform (DCP) is a Sutron SatLink 2 in external box. The AccuBubble sensor is referenced to an outside cantilever chain gage that was completed Oct 17, 2008. A Sutron Model 56-0540 stage discharge recorder (SDR) was installed in the shelter on May 23, 2008 to provide backup data when the well intake pipes are not isolated from the stream during low stages. The SDR is set by drop tape from an inside reference point on the equipment shelf.
Hydrographic Conditions.--	Streambed is composed of boulders, cobble, and gravel. Banks are moderately steep and not usually subject to overflow. The left abutment of bridge adjacent to gage constricts flow into the right side of the channel immediately above gage. Record includes water imported from Thompson Creek (Roaring Fork Basin), Clear Fork (Muddy Creek Basin), and Owens Creek (Plateau Creek Basin).
Gage-Height Record.--	The primary record is hourly averages of 15-minute data from the AccuBubble sensor. The SDR record is used as backup. The record is complete and reliable for the six month period of operation (Apr 1 – Sep 30). Several instrument calibration corrections were made to the AccuBubble and SDR during the period of record. From Apr 1 to May 8, 2009, the instrument calibration corrections include a -0.02 ft datum correction to compensate for the adjustment to the outside R.P. that was not reflected in the AccuBubble readings. A problem communicating with the SatLink in the field on May 8, 2009 led to replacement of the SatLink with no loss in record accuracy.
Datum Corrections.--	Levels were run on Apr 22, 2009. Using RM 4 as a base, the outside cantilever chain gage (R.P. for the AccuBubble) was determined to read 0.02 ft high. The cantilever chain gage was adjusted by -0.02 ft, but the AccuBubble offset was not adjusted to reflect the change until the visit on May 8. As discussed in the GAGE-HEIGHT RECORD section, a -0.02 ft datum correction was applied to correct the gage height readings during this time. Levels were run again on Jul 14, 2009. Using RM 4 as a base, the outside cantilever chain gage was found to read correct and no adjustments were made. The inside reference point (R.P. for the SDR) was determined to be 0.01 ft high (i.e., at 10.00 ft). The R.P. could not be adjusted down to 9.99 ft so the tape was lengthened to 10.00 ft to compensate. During future level runs, reference points will not be adjusted unless discrepancy is greater than 0.02 ft.
Rating.--	The control for low and medium stages is a boulder and cobble riffle 15 ft downstream. Control for higher stages is the channel with boulders having some effect. Rating No. 16 was developed Feb 26, 2010 using measurement nos. 16–26 and is reasonably well-defined between 2.0 and 300 cfs. This rating was used for the entire period of record (Apr 1–Sep 30) during Water Year 2009. Six discharge measurements (21–26) made during WY 2009 were used for analysis. Measurements ranged in discharge from 1.37 to 264 cfs and cover the range of discharge experienced except for the lower daily flows of Aug 20–24, 28–31; and Sep 1–15, 19, 24–30, 2009 and the higher average daily flows of May 7–13. The peak recorded gage height of 4.20 ft occurred at 22:30 on May 8, 2009 when a shift of -0.03 ft resulted in a discharge of 433 cfs. The maximum gage height exceeded the stage of high measurement 22 by 0.48 ft.
Discharge.--	A shifting control method was used during WY 2009. The shifts were applied using the variable stage-shift relationship WSDRAVCOVS16 for the entire six month period. Raw shifts ranged from -0.07 ft to 0.09 ft and measurement nos. 21, 24 and 26 were discounted -6 % to 3 % to develop the variable stage-shift relationship.
Special Computations.--	None.
Remarks.--	Record is rated as good, except periods when mean daily flows were less than 2.5 cfs to 3 cfs, which are rated as fair. Station was maintained by Craig Bruner and record was developed by James Kellogg.
Recommendations.--	Run levels in late March, prior to period of station operation, and attempt to determine gage heights where breakpoints in stage-discharge rating may occur.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09089500 WEST DIVIDE CREEK NEAR RAVEN

RATING TABLE--

WSDRAVCO16 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	7.7	217	213	54	5.8	0.82
2	---	---	---	---	---	---	10	205	193	55	4.5	0.82
3	---	---	---	---	---	---	6.5	201	200	68	3.7	0.78
4	---	---	---	---	---	---	6	191	183	60	3.1	0.79
5	---	---	---	---	---	---	7.2	188	170	51	2.8	0.99
6	---	---	---	---	---	---	9.3	243	156	42	3.3	1
7	---	---	---	---	---	---	15	306	138	35	3.9	1.3
8	---	---	---	---	---	---	29	311	123	31	2.7	1.1
9	---	---	---	---	---	---	39	298	115	27	2.2	0.99
10	---	---	---	---	---	---	36	301	116	24	2.1	0.84
11	---	---	---	---	---	---	42	308	129	24	2.4	0.75
12	---	---	---	---	---	---	31	324	115	23	1.7	0.69
13	---	---	---	---	---	---	29	303	103	23	1.6	0.71
14	---	---	---	---	---	---	43	258	102	21	1.8	0.92
15	---	---	---	---	---	---	61	244	101	17	2.7	1.2
16	---	---	---	---	---	---	65	230	99	15	2.1	2.2
17	---	---	---	---	---	---	43	215	94	13	1.7	2.4
18	---	---	---	---	---	---	37	209	96	11	1.5	1.6
19	---	---	---	---	---	---	46	203	96	10	1.4	1.2
20	---	---	---	---	---	---	83	178	90	11	1.3	1.6
21	---	---	---	---	---	---	124	161	104	11	1.2	2.4
22	---	---	---	---	---	---	154	167	94	8.4	1	1.6
23	---	---	---	---	---	---	159	161	84	7.2	0.99	1.4
24	---	---	---	---	---	---	158	233	80	6.3	1.1	1.3
25	---	---	---	---	---	---	163	229	78	5.9	1.6	1.3
26	---	---	---	---	---	---	153	188	107	9.5	2.5	1.3
27	---	---	---	---	---	---	113	159	105	15	1.6	1.2
28	---	---	---	---	---	---	111	144	80	7.4	1.2	1.2
29	---	---	---	---	---	---	146	133	70	6.9	1	1.1
30	---	---	---	---	---	---	199	134	61	8.6	0.94	1.1
31	---	---	---	---	---	---	---	189	---	8.3	0.92	---
TOTAL	---	---	---	---	---	---	2125.7	6831	3495	709.5	66.35	36.60
MEAN	---	---	---	---	---	---	70.9	220	117	22.9	2.14	1.22
AC-FT	---	---	---	---	---	---	4220	13550	6930	1410	132	73
MAX	---	---	---	---	---	---	199	324	213	68	5.8	2.4
MIN	---	---	---	---	---	---	6	133	61	5.9	0.92	0.69

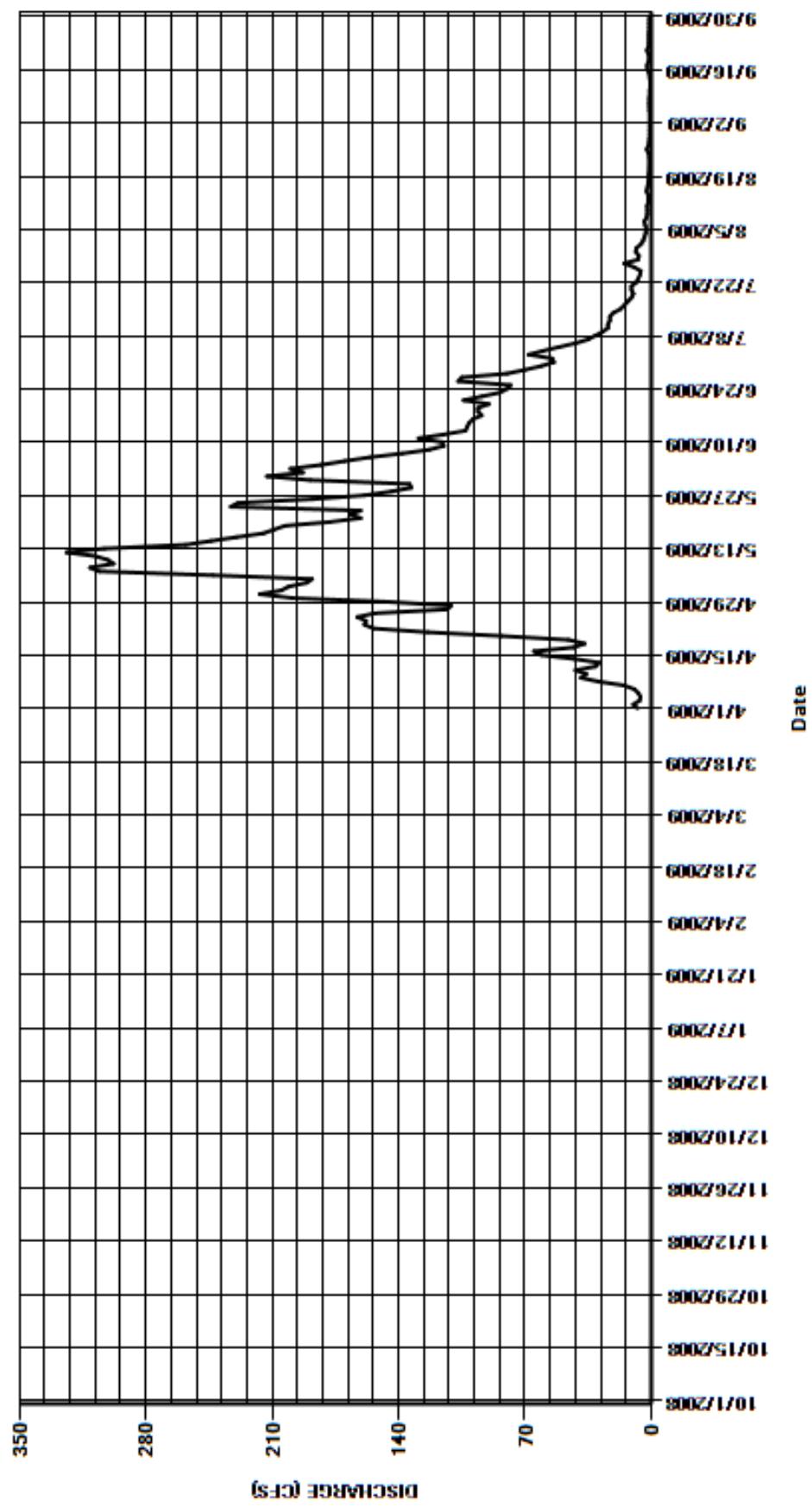
CAL YR	2008	TOTAL	16279.6	MEAN	89	MAX	390	MIN	1.3	AC-FT	32290	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	13264.15	MEAN	72.5	MAX	324	MIN	0.69	AC-FT	26310	(PARTIAL YEAR RECORD)

MAX DISCH: 433 CFS AT 22:30 ON May. 08,2009 GH 4.2 FT. SHIFT -0.03 FT.

MAX GH: 4.2 FT. AT 22:30 ON May. 08,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09089500 WEST DIVIDE CREEK NEAR RAVEN
WY2009 HYDROGRAPH



NORTH PLATTE RIVER BASIN
MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
Water Year 2009

Location.--	Lat. 40°36'48", Long. 106°05'05", (Gould, Colorado Quadrangle, 1955), SE1/4 of the SE1/4 in Section 36 T8N, R78W in Jackson County. Under bridge on County Road 30 about 700 feet upstream of its confluence with Peterson Creek.
Drainage and Period of Record.--	Approximately 99 sq. mi. Formerly known as the Michigan River near Gould station and was relocated due to removal of bridge. Station has been in operation at present location since 1997.
Equipment.--	Sutron shaft encoder (SDI12) housed in 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located in a gray NEMA box on the same side of the river but on the upstream side of the bridge. The outside staff, with a range of 0.00 to 6.66 feet, is the primary reference gage. It is located on the right bridge abutment just to the left of the stilling well.
Hydrographic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain on the Continental Divide near Thunder Mountain. In the vicinity of the gage station, the channel slope is moderate and has moderate sinuosity. The bed material ranges from silt up to small rock approximately 6-inches in diameter. Meadow Creek Reservoir and several major diversions, located upstream of the gage, can impact flow at the gage.
Gage-Height Record.--	Primary record is 15-minute data from the DCP. Continuous gage height records were kept from October 1 to November 17, 2008 and April 7 to September 30, 2009. Record was not kept during the winter period. The record is complete and reliable except for the following dates: November 17, 2008 (shut-down), April 7, 2009 (start-up), November 14-16, 2008 (affected by ice), and October 21-28, 2008 and September 21-24, 2009 (affected by beaver dam). Gage height datum corrections (ranging from -0.10 feet to +0.20 feet) were made at the time of site visit or at the time of record preparation.
Datum Corrections.--	Levels were not run in WY2009. Levels were last run June 14, 2006 to the outside staff gage. No corrections or adjustments were made.
Rating.--	There is no man-made control at this site. The control is a rocky channel. Rating No. 6, developed on February 21, 2006 and expanded on June 11, 2007, was used for WY2009. It is well defined to 894 cfs, 150% of the historical highest measurement made in water year 2003. Nine measurements (numbers 74 through 82), ranging in discharge from 5.70 cfs to 227 cfs, were made in the record period. These measurements covered the lower range in discharge and the higher range except for the higher daily flows on May 24-27 and 31; June 1-8, 11, 26, and 27; and July 5, 2009. The instantaneous peak flow of 437 cfs occurred on May 26, 2009 at 03:15 at a gage height of 3.09 feet and a shift of 0.06 feet and exceeded Measurement 77, made on May 20, 2009 by 0.74 ft. in stage. Minimum daily flow of 5.7 cfs occurred on September 5, 2009.
Discharge.--	Shifting control method was applied throughout WY2009. Shifts were applied as defined by measurements and were distributed by time throughout the period of record. Open-water measurements showed shifts varying between -0.06 and +0.14 feet. Shifts were applied directly and given full weight, except for Measurement 82 which was not used for shift distribution and Measurements 75, 78, and 80, which were discounted from -3% to +11% to smooth shift distribution. Shifts (after discounting) ranged from -0.04 to +0.06 feet.
Special Computations.--	Discharge was computed for shut-down and start-up days based on actual partial day DCP data. Flows for days affected by ice were estimated based on adjacent good data. Discharge values were estimated by use of field gage height readings and/or interpolation between spot values and previous and subsequent periods of good record. Datum corrections were applied during record preparation to compensate for an incorrect encoder adjustment made on October 28, 2008 and also to correct for gage height alterations due to beaver dam construction in October 2008 and September 2009.
Remarks.--	The record is good, complete and reliable except for the following dates: November 17, 2008 (shut-down), April 7, 2009 (start-up), which is considered fair to poor; November 14-16, 2008 (affected by ice), which is considered fair; and October 21-28, 2008 and September 21-24, 2009 (affected by beaver dam), which is considered fair.
Recommendations.--	Rating No. 6 should continue to be revisited as additional measurements are made and data points become available. Determine whether a new rating table should be developed in WY2010. Gage operated and maintained and record developed by Jean Ray.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR

RATING TABLE--

MICMERCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.3	6.4	---	---	---	---	---	129	229	140	38	7.3
2	9	6.2	---	---	---	---	---	110	283	180	31	6.6
3	9.3	6.4	---	---	---	---	---	152	327	163	27	6.4
4	10	6.3	---	---	---	---	---	103	310	181	26	6.8
5	11	6.2	---	---	---	---	---	94	285	229	23	5.7
6	11	5.9	---	---	---	---	---	90	250	201	23	5.8
7	11	6.3	---	---	---	---	e24	124	243	168	23	6
8	10	6.5	---	---	---	---	26	132	241	142	21	6
9	9.6	6.7	---	---	---	---	30	105	210	122	20	6
10	9.6	9.6	---	---	---	---	32	106	227	105	19	6.4
11	9.5	23	---	---	---	---	33	111	251	95	18	7
12	11	22	---	---	---	---	34	147	212	106	18	10
13	12	22	---	---	---	---	37	171	178	92	16	13
14	11	e20	---	---	---	---	40	145	163	90	19	13
15	11	e22	---	---	---	---	41	150	174	87	25	15
16	11	e24	---	---	---	---	42	148	189	78	26	17
17	12	e24	---	---	---	---	39	156	158	67	22	11
18	12	---	---	---	---	---	38	179	161	59	19	8.2
19	12	---	---	---	---	---	39	218	165	56	17	8.9
20	11	---	---	---	---	---	46	215	166	53	16	8.3
21	e12	---	---	---	---	---	59	210	169	50	15	e11
22	e15	---	---	---	---	---	71	202	175	47	14	e16
23	e11	---	---	---	---	---	67	217	179	44	15	e13
24	e12	---	---	---	---	---	75	266	162	40	15	e11
25	e9.3	---	---	---	---	---	112	351	178	39	11	10
26	e8.7	---	---	---	---	---	130	377	260	38	9.9	9.2
27	e6.9	---	---	---	---	---	105	271	271	41	9.9	8.6
28	e6	---	---	---	---	---	87	217	215	43	8.3	8
29	6	---	---	---	---	---	107	196	168	42	7.4	6.7
30	6.4	---	---	---	---	---	135	200	144	45	7.2	7.6
31	6.4	---	---	---	---	---	---	239	---	41	7.5	---
TOTAL	311.0	223.5	---	---	---	---	1449	5531	6343	2884	567.2	275.5
MEAN	10	13.1	---	---	---	---	60.4	178	211	93	18.3	9.18
AC-FT	617	443	---	---	---	---	2870	10970	12580	5720	1130	546
MAX	15	24	---	---	---	---	135	377	327	229	38	17
MIN	6	5.9	---	---	---	---	24	90	144	38	7.2	5.7

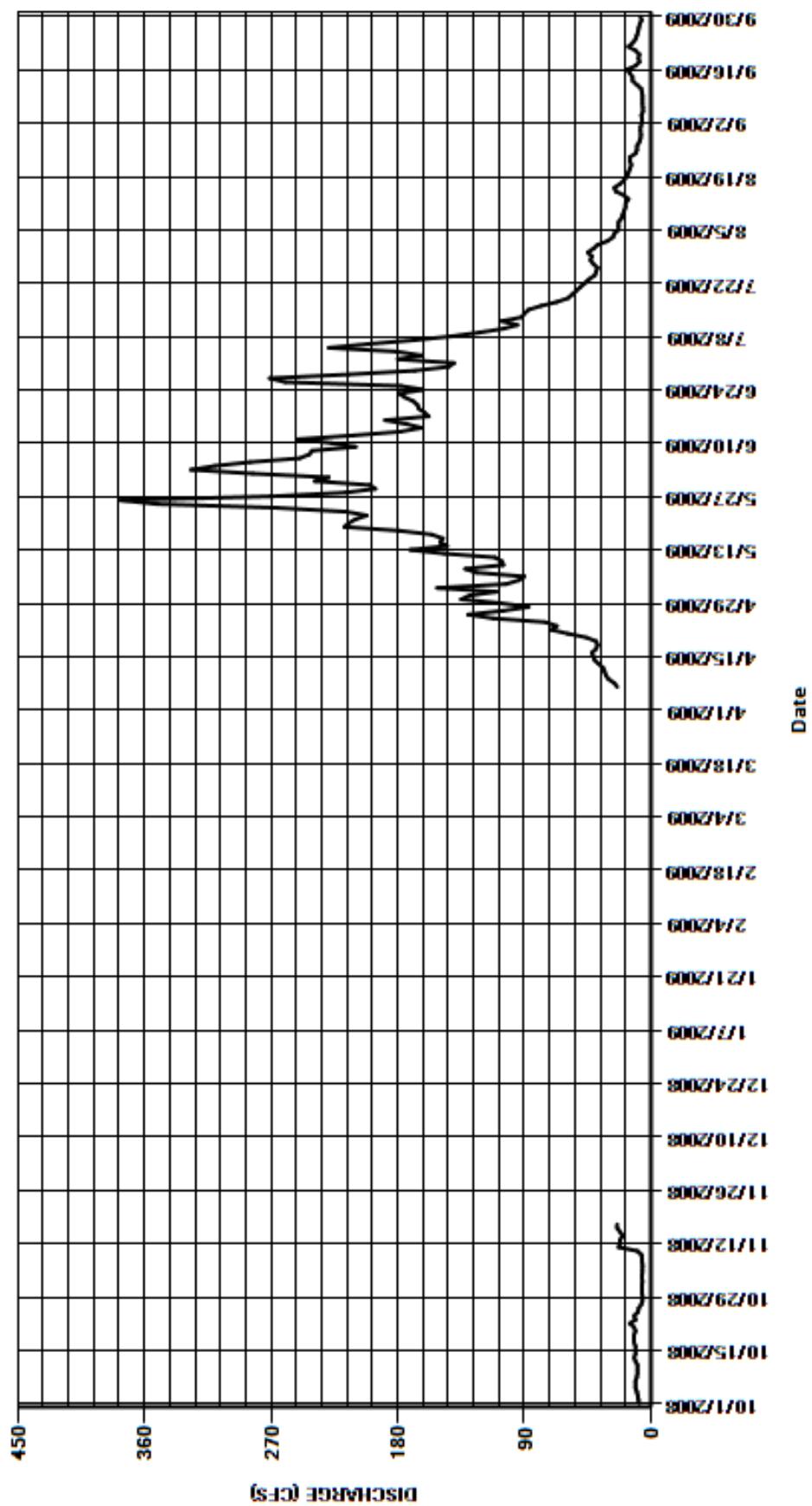
CAL YR	2008	TOTAL	21168.8	MEAN	92.4	MAX	473	MIN	5.1	AC-FT	41990	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	17584.2	MEAN	78.2	MAX	377	MIN	5.7	AC-FT	34880	(PARTIAL YEAR RECORD)

MAX DISCH: 437 CFS AT 03:15 ON May. 26,2009 GH 3.09 FT. SHIFT 0.06 FT.

MAX GH: 3.09 FT. AT 03:15 ON May. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
WY2009 HYDROGRAPH



NORTH PLATTE RIVER BASIN

06617100 MICHIGAN RIVER AT WALDEN, CO.

Water Year 2009

Location.--	Lat. 40 44'27", Long. 106 16'54", (Walden, Colorado Quadrangle, 1955), NW1/4 of the NW1/4 in Section 21 T9N, R79W in Jackson County. On Jackson County property immediately upstream of the State Highway 125 Bridge crossing the Michigan River.
Drainage and Period of Record.--	Approximately 182 sq. mi. Originally established by the USGS at a location believed to be just upstream of the present location in May 1904. Records kept by the USGS from May 1904 to October 1905 and May 1923 to October 1947. Re-established by the State Engineer's Office in May 2002. Records kept by the Town of Walden from 1916 to present.
Equipment.--	Sutron shaft encoder Model SE5600-0531 and high data rate Data Collection Platform (DCP) with satellite telemetry housed in a structure mounted on top of a 24-inch diameter corrugated metal pipe stilling well with two two-inch diameter inlet pipes. An electric drop tape, installed on June 14, 2006, is the primary reference gage.
Hydrographic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain on the Continental Divide near Thunder Mountain. In the vicinity of the gage station, the channel slope is mild and has moderate sinuosity. The channel is composed of small rock, gravel, and sand. Flow is affected by upstream reservoir releases, diversions, and the Walden water plant.
Gage-Height Record.--	Primary record is 15 minute data from the DCP. Continuous gage height records were kept from October 1 to November 17, 2008 and April 27 to September 30, 2009. Record was not kept during the winter period. The record is complete and reliable except for the following dates: November 17, 2008 (shut-down); April 27 (start-up); and, October 23, 24, and 27 and November 6, 7, and 14-16, 2008, which were affected by ice. An attempt was made to open the site on April 7, but due to ice in the stilling well and DCP issues, actual start-up was delayed until April 27. Insufficient data were available to estimate flow between April 7 and April 26, 2009. A gage height correction of 0.01 feet was made at the time of record preparation.
Datum Corrections.--	Levels were not run in WY2009. Levels were last run on June 14, 2006. Elevations of the benchmarks and electric tape index were established at that time.
Rating.--	The control at extreme high discharges is the Highway 125 Bridge. For lower flows, the control is a natural rock riffle located just downstream of the bridge. Rating No. 13 began on October 1, 2008 and was used the entire period of record. It is well defined to flows of 273 cfs, 150% of the historical highest discharge measurement made in WY2005. Eight measurements (numbers 74 through 81), ranging in discharge from 12.6 cfs to 94.1 cfs, were taken during the record period. These measurements covered the range in discharge except for higher daily flows on May 25-29 and 31, June 1-22 and 26-30, and July 2-10 and 13-14, 2009; and lower daily flows on October 2-16, 2008, and May 6-15, August 29-30, and September 4-22 and 25-29, 2009. The instantaneous peak flow of 374 cfs, which occurred on May 27, 2009 at 06:00 at a gage height of 2.79 feet and a shift of 0.01 feet, exceeded Measurement No. 77, made on June 25, 2009 by 1.25 ft. in stage. Minimum daily flow of 4.4 cfs occurred on May 13, 2009.
Discharge.--	Shifting control method was applied throughout the period of record. Shifts were applied as defined by measurements and were distributed by time. Discharge measurements showed raw shifts ranging between -0.03 and +0.02 feet. Shifts were applied directly and given full weight, except for Measurement Nos. 76 and 79, which were discounted -6% and 3%, respectively, to smooth shift distribution.
Special Computations.--	The station is closed during the winter months and no discharges are estimated during this period. Discharge was computed for November 17, 2008 (shut-down) and April 27, 2009 (start-up), based on actual partial day DCP data. Flows for October 23, 24, and 27 and November 6, 7, and 14-16, 2008 (affected by ice) were estimated based on adjacent good gage height data and consideration of temperature and precipitation data from the Colorado Climate Center (Walden, CO). Discharge values were estimated by use of field gage height readings and/or interpolation between spot values and previous and subsequent periods of good record.
Remarks.--	The record is good except for the following periods May 26-27, June 2-5, 11, and 12, and July 7, 2009 when flows exceeded the maximum measured discharge at the gage by 150%. Discharge during this period should be considered poor. This includes the peak instantaneous discharge, which should also be considered poor. Estimated flows on November 17, 2008 (shut-down); April 27 (start-up); and, October 23, 24, and 27 and November 6, 7, and 14-16, 2008 (affected by ice) should be considered fair.
Recommendations.--	The bridge by the gage station should not be used for bridge measurements due to narrow width and heavy vehicle traffic. CDOT is in the planning stages of bridge replacement. There is currently no means of making high flow measurements at this site. Gage operated and maintained and record developed by Jean Ray.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06617100 MICHIGAN RIVER AT WALDEN, CO.

RATING TABLE--

MICWLDCO13 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

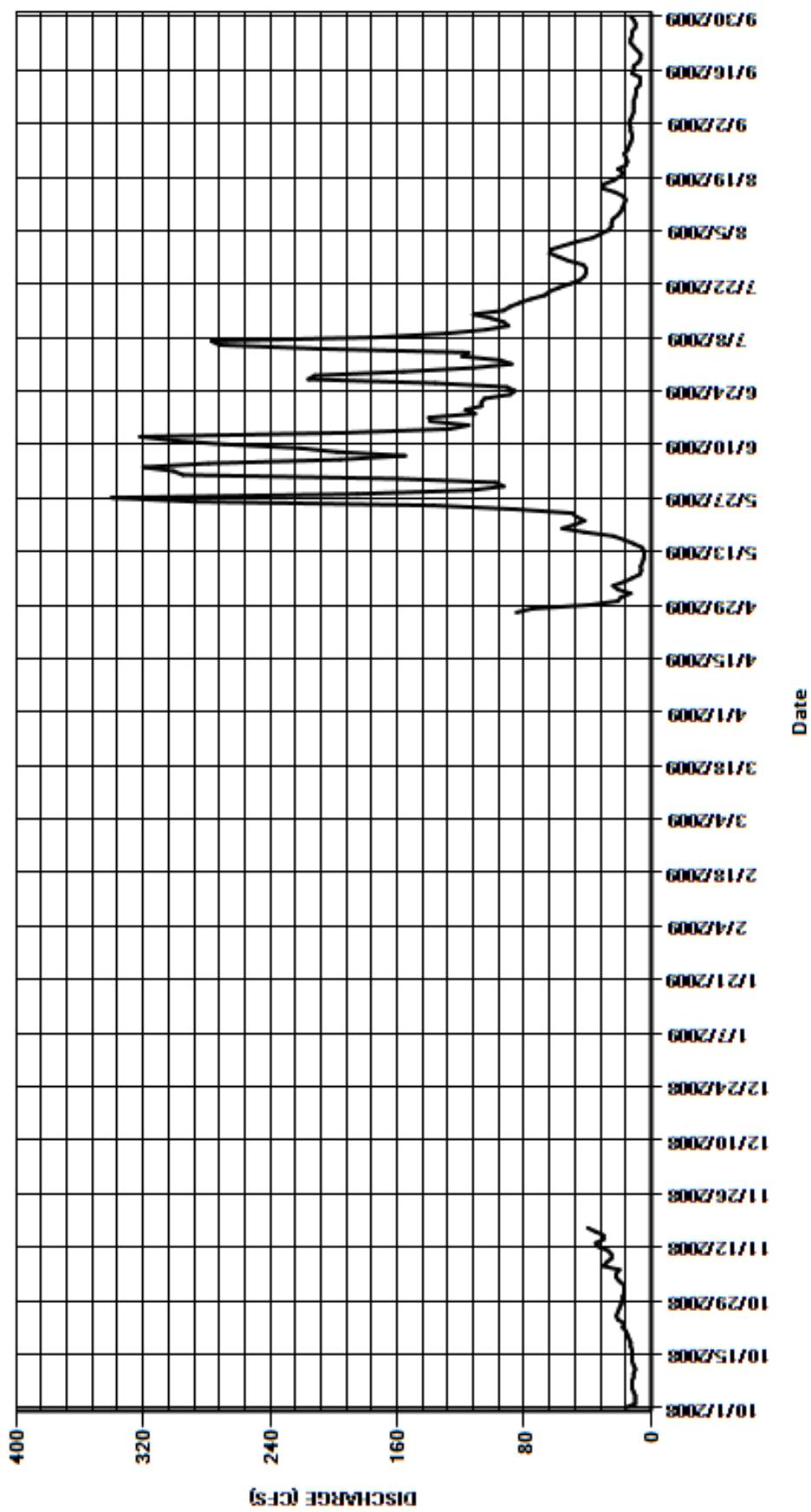
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	17	---	---	---	---	---	19	160	88	55	13
2	10	17	---	---	---	---	---	13	295	95	47	14
3	10	20	---	---	---	---	---	21	301	119	37	13
4	10	22	---	---	---	---	---	24	320	115	32	12
5	11	22	---	---	---	---	---	17	279	210	27	11
6	12	e20	---	---	---	---	---	12	196	272	25	11
7	12	e30	---	---	---	---	---	7	155	277	25	11
8	12	28	---	---	---	---	---	6.3	198	172	24	11
9	11	25	---	---	---	---	---	6.7	221	129	21	10
10	11	25	---	---	---	---	---	5.6	269	104	19	9.6
11	10	27	---	---	---	---	---	4.8	301	90	18	9.5
12	11	33	---	---	---	---	---	4.5	322	93	17	7.3
13	12	35	---	---	---	---	---	4.4	193	101	16	6.8
14	12	e30	---	---	---	---	---	5.8	127	112	18	7
15	12	e30	---	---	---	---	---	11	115	93	23	12
16	12	e35	---	---	---	---	---	17	139	89	31	11
17	13	e40	---	---	---	---	---	24	140	83	30	11
18	13	---	---	---	---	---	---	42	111	76	24	7.9
19	14	---	---	---	---	---	---	56	117	67	20	6.7
20	15	---	---	---	---	---	---	48	107	64	17	6.5
21	16	---	---	---	---	---	---	42	107	58	21	8.7
22	18	---	---	---	---	---	---	47	105	51	16	11
23	e17	---	---	---	---	---	---	50	89	45	15	13
24	e21	---	---	---	---	---	---	86	86	42	16	13
25	22	---	---	---	---	---	---	137	91	41	17	12
26	21	---	---	---	---	---	---	287	136	41	15	12
27	e20	---	---	---	---	---	e85	340	216	43	14	10
28	19	---	---	---	---	---	75	185	212	52	13	9.8
29	18	---	---	---	---	---	38	113	156	58	12	11
30	18	---	---	---	---	---	21	93	112	64	12	13
31	17	---	---	---	---	---	---	98	---	63	13	---
TOTAL	446	456	---	---	---	---	219	1827.1	5376	3007	690	314.8
MEAN	14.4	26.8	---	---	---	---	54.7	58.9	179	97	22.3	10.5
AC-FT	885	904	---	---	---	---	434	3620	10660	5960	1370	624
MAX	22	40	---	---	---	---	85	340	322	277	55	14
MIN	10	17	---	---	---	---	21	4.4	86	41	12	6.5
CAL YR	2008	TOTAL	21857.8	MEAN	109	MAX	595	MIN	8.5	AC-FT	43350	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	12335.9	MEAN	60.2	MAX	340	MIN	4.4	AC-FT	24470	(PARTIAL YEAR RECORD)

MAX DISCH: 374 CFS AT 06:00 ON May. 27,2009 GH 2.79 FT. SHIFT 0.01 FT.

MAX GH: 2.79 FT. AT 06:00 ON May. 27,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06617100 MICHIGAN RIVER AT WALDEN, CO.
WY2009 HYDROGRAPH



NORTH PLATTE RIVER BASIN
06617500 ILLINOIS RIVER NEAR RAND
Water Year 2009

Location.--	Lat. 40°27'45", Long. 106°10'30", (Rand Quadrangle, 1956), in SW1/4 of the NE1/4 of Section 29, T6N, R78W in Jackson County, on right upstream bridge abutment on Jackson County Road 27.
Drainage and Period of Record.--	Approximately 70.6 sq. mi. (from topographic maps). Established by the State Engineer's Office. Formerly published as Illinois Creek near Rand (1931-1940) at similar location. Hydrographic measurements taken in 1981 and 1985, but no records were kept. Records kept from 1987 to present. Records published in 1995 and 2002 through the present.
Equipment.--	Sutron shaft encoder (SDI12) housed in 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located several feet back from the channel bank in a gray housing box. Primary reference is an outside staff gage, with a range of 0.00 to 3.33 feet, located on the bridge abutment just to the left of the well. Altitude of gage is approximately 8550 ft (from topographic map).
Hydrographic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain up at the Continental Divide. In the vicinity of the gage station, the channel slope is moderate, but has a high sinuosity. The bed material ranges from silt up to small rock approximately 4-inches in diameter.
Gage-Height Record.--	Primary record is 15-minute data from the DCP. Continuous record was kept from October 1 to November 17, 2008 and April 7 to September 30, 2009. Due to weather constraints, the gage station is closed in the winter months. The gage station was visited on 11 separate occasions to ensure the instruments remained calibrated. Calibration corrections were made on four occasions where the shaft encoder was adjusted (from -0.03 feet to -0.01 feet) to match the primary reference gage. In addition, on September 2, 2009, the shaft encoder tape (which had slipped off the reel during flushing on September 1, 2009) was reset. Record is complete and reliable except for the following: November 17, 2008: partial day record; station shut down for season. April 7, 2009: partial day record; station open for season.
Datum Corrections.--	Levels were not run during WY2009 and were last run on June 14, 2006.
Rating.--	The stilling well is located upstream of the bridge at the right abutment. The channel is straight for at least 100-feet upstream to 50-feet downstream of the bridge. A small tributary joins the Illinois just upstream of the gage station. The bridge, at times, may act as control. Otherwise, the natural channel acts as the control. Rating No. 6, dated June 3, 2008, was used throughout the water year. Nine measurements (numbered 98 through 106), ranging in discharge from 5.70 cfs to 215 cfs, were taken this water year. These measurements covered the range in discharge except for lower daily flows on September 3-7 and 10-13, 2009 and higher daily flows on May 25-26, 2009. The instantaneous peak flow of 276 cfs occurred on May 26, 2009 at 06:15 at a gage height of 2.76 feet and a shift of 0.03 feet and exceeded Measurement No. 101, made on May 20, 2009 by 0.40 ft. in stage.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and were distributed by time. Open-water measurements showed shifts ranging between -0.01 and +0.12 feet. Shifts were applied directly and given full weight, except for Measurements Nos. 98, 99, 100, and 102, which were discounted between 2% and 7%, respectively, to smooth shift distribution.
Special Computations.--	Discharge values were estimated for November 17, 2008 (shut-down) and April 7, 2009 (start-up) based on partial day record and consideration of previous and subsequent days of good record.
Remarks.--	The record is good except for November 17, 2008 and April 7, 2009, which were estimated and are considered poor.
Recommendations.--	Reassess Rating No. 6 developed in WY 2008 (after the stock fence located downstream of the bridge washed out). Gage operated and maintained by and record developed by Jean Ray.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06617500 ILLINOIS RIVER NEAR RAND

RATING TABLE--

ILLRANCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.6	9.1	---	---	---	---	---	104	127	77	28	5.7
2	8.5	9.4	---	---	---	---	---	100	148	90	24	5.7
3	9.6	10	---	---	---	---	---	112	156	110	21	5.6
4	11	10	---	---	---	---	---	100	167	117	20	5.2
5	11	11	---	---	---	---	---	92	154	123	18	5.1
6	12	9.2	---	---	---	---	---	81	143	97	17	5.5
7	11	8.6	---	---	---	---	e20	97	141	85	16	5.6
8	10	8.5	---	---	---	---	24	122	126	81	12	6
9	9.5	9.3	---	---	---	---	29	122	113	72	11	6
10	9.1	10	---	---	---	---	27	121	108	67	11	5.6
11	8.8	10	---	---	---	---	33	113	134	64	10	5.2
12	9	9.5	---	---	---	---	31	127	117	67	9.2	4.9
13	9.5	12	---	---	---	---	32	160	110	62	8.7	4.7
14	9.3	8.6	---	---	---	---	37	147	101	61	9.7	6.9
15	8.9	10	---	---	---	---	39	128	111	53	12	11
16	9.5	9.7	---	---	---	---	40	139	124	49	12	14
17	9.3	e10	---	---	---	---	28	159	106	45	10	8.9
18	9.7	---	---	---	---	---	26	178	103	43	9	6.9
19	9.3	---	---	---	---	---	31	205	102	40	8.5	6.4
20	9.3	---	---	---	---	---	40	208	102	38	8.2	6.2
21	9.8	---	---	---	---	---	51	202	107	35	8	7.8
22	11	---	---	---	---	---	64	174	107	33	7.7	10
23	11	---	---	---	---	---	73	156	108	31	7.3	9.5
24	11	---	---	---	---	---	84	182	104	29	6.9	9.4
25	11	---	---	---	---	---	92	217	108	28	7.9	8.7
26	12	---	---	---	---	---	106	252	149	28	8	8.5
27	11	---	---	---	---	---	96	185	137	30	8.1	8.9
28	10	---	---	---	---	---	81	158	119	28	6.9	7.8
29	10	---	---	---	---	---	82	134	97	26	6.1	7.7
30	9.7	---	---	---	---	---	91	121	86	31	5.8	7.3
31	9.3	---	---	---	---	---	---	147	---	28	5.8	---
TOTAL	308.7	164.9	---	---	---	---	1257	4543	3615	1768	353.8	216.7
MEAN	9.96	9.7	---	---	---	---	52.4	147	121	57	11.4	7.22
AC-FT	612	327	---	---	---	---	2490	9010	7170	3510	702	430
MAX	12	12	---	---	---	---	106	252	167	123	28	14
MIN	8.5	8.5	---	---	---	---	20	81	86	26	5.8	4.7

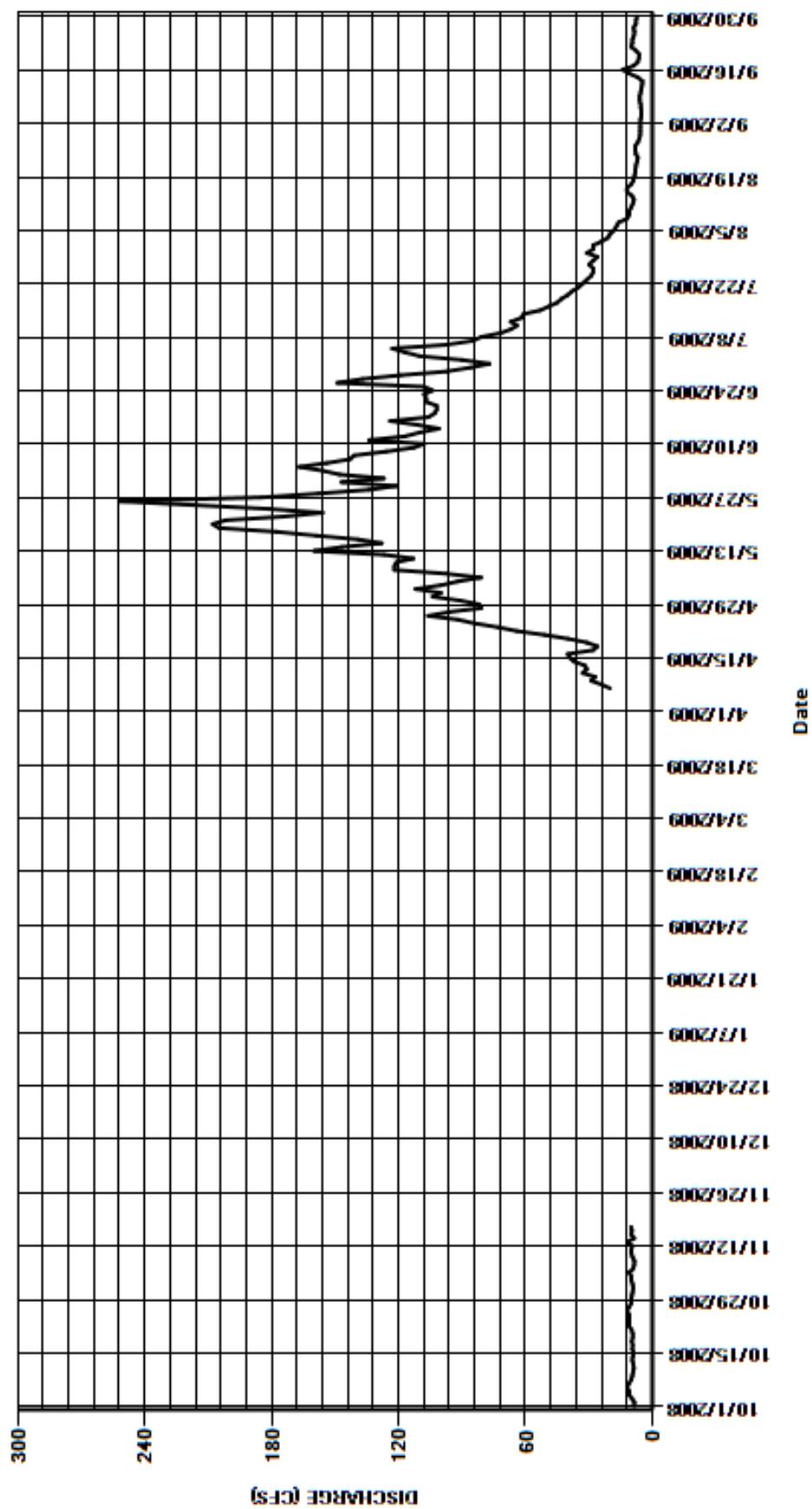
CAL YR	2008	TOTAL	14988.8	MEAN	70	MAX	446	MIN	5.3	AC-FT	29730	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	12227.1	MEAN	54.3	MAX	252	MIN	4.7	AC-FT	24250	(PARTIAL YEAR RECORD)

MAX DISCH: 276 CFS AT 06:15 ON May. 26,2009 GH 2.76 FT. SHIFT 0.03 FT.

MAX GH: 2.76 FT. AT 06:15 ON May. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06617500 ILLINOIS RIVER NEAR RAND
WY2009 HYDROGRAPH



YAMPA RIVER BASIN
MORRISON CREEK BELOW SILVER CREEK
Water Year 2009

Location.--	Lat. 40° 14'44", Long. 106° 47'12", (Green Ridge Quadrangle), in Section 10, T3N, R84W in Routt County, Hydrologic Unit 14050001, on the left bank of Morrison Creek approximately 50 feet below the bridge located immediately downstream of the confluence of Silver Creek and Morrison Creek.
Drainage and Period of Record.--	71.86 square miles. Established by the State Engineer's Office in October 2008.
Equipment.--	Station established in October 8, 2008. Sutron shaft encoder (SDI12) connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry housed in an 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes with cleanouts. Primary reference is an electric drop tape inside the well. An old staff gage remains in the creek but should not be used as a reference since its datum does not match the primary reference.
Hydrographic Conditions.--	71.9 square miles of drainage within the basin of moderate terrain near the gage station, originates in steep mountainous terrain of the Silver Creek and Morrison Creek drainages in the Routt National Forest south of the Service Creek Wilderness Area. The channel slope is moderate and consists of gravel and small to medium size cobbles ranging from 4 to 12 inches in diameter. Some large boulders are located along the banks and in the vicinity of the bridge. Gage location is immediately downstream of the Morrison Creek bridge crossing just downstream of the confluence of Morrison Creek and Silver Creek. The channel is straight for at least 100 feet downstream of the gage. The right and left banks are subject to overflow.
Gage-Height Record.--	Primary record is hourly data developed from the DCP data log of 15-minute observations. Continuous record kept from October 8 - November 18, 2008 and April 22 - September 30, 2009. Due to weather constraints, the gage station is closed in the winter months. The gage station was visited on 10 separate occasions to ensure the instruments remained calibrated. One calibration correction was made on May 27, 2009 where the shaft encoder was adjusted by +0.01 ft. to match the primary reference gage. Record is complete and reliable except for the following periods: Oct. 8, 2008 partial day record, when the gage recording instruments were installed. Nov. 15-18, 2008 when ice affected the stage-discharge relationship. Nov. 18, 2008 partial day record as the station was shut down for the winter. Apr. 22, 2008 partial day record, station opened after the winter season .
Datum Corrections.--	None applied. Initial levels were run on October 7, 2008. Benchmarks were established on that date. RM-1 (BM-1) is top rock on NW corner of bridge; el = 7.78 ft. RM-2 is top of staff gage in channel (3.30 ft mark); el = 3.68 ft. RP: is electric tape index; 9.415 ft. PZF: elevation is approximately 1.00 ft.
Rating.--	At low flows the control is a natural small cobble riffle downstream of the gage. At medium flows the small cobble riffle is drowned out as the channel controls. At higher flows the channel will overbank on the right and left side of the channel which consist of willows, small shrubs and grass.. The PZF in the channel is approximately 1.00 ft. Rating No. 2, dated October 8, 2008, was used for WY2009. It is defined to 490 cfs (150% of the highest discharge measurement made at the gage). Nine measurements (Nos. 1- 9) were made this year, ranging in discharge from 7.36 cfs to 326 cfs. These measurements covered the range in discharge except for lower daily flows on August 21-24 and 28-31 and September 1-7, 10-14, 18-20, and 29, 2009 and higher daily flows on April 24 and May 12-27, 2009. The instantaneous peak flow of 526 cfs occurred on May 20, 2009 at 22:00 at a gage height of 4.70 feet (+0.01 feet gage height correction applied) and a shift of -0.05 feet, exceeded Measurement No. 4, made on May 27, 2009 by 0.76 feet in stage.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from October 8 - November 18, 2008 and August 11 (11:00) - September 30, 2009. Shift curve VAR 1 was used from April 22 (08:00) - August 11 (10:00), 2009. Open-water measurements showed shifts varying between -0.06 and +0.04 feet. Shifts were applied directly and given full weight, except for Measurement No. 9, which was discounted -3% to smooth shift distribution.
Special Computations.--	Discharges were estimated on start-up dates (October 8, 2008 and April 22, 2009) and on ice-affected days (November 15-18, 2008) using partial day record, ice affected record and temperature data provided by the Colorado Climate Center (station ID 57936 located in Steamboat Springs, CO).
Remarks.--	The record is considered fair throughout the record period. It is rated fair because it is a new gage with natural channel control and the stage-discharge relationship is not yet well defined. Discharge was estimated on October 8 (new gage), November 18, 2008 (shut-down) and April 22, 2009 (start-up), based on partial day record. Flows on November 15-18, 2008 were affected by ice and were estimated based on adjacent non-ice affected data and temperature data. Discharge for ice affected and partial day record should be considered poor.
Recommendations.--	Re-evaluate the rating after a second year of data collection. Assess measurement cross-section, especially at low flow periods (gage heights 1.7 – 1.8') and evaluate factors that are potentially contributing to shift variations at low flow (moss, irrigation pumping, upstream diversion procedures, gravel operations, sand bar, beaver dam, etc.). Gage operated and maintained and record developed by Jean Ray.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MORRISON CREEK BELOW SILVER CREEK

RATING TABLE--

MORBSCCO02 USED FROM 08-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	9.9	---	---	---	---	---	203	262	53	21	6.3
2	---	10	---	---	---	---	---	203	266	51	17	6.2
3	---	12	---	---	---	---	---	255	274	67	14	5.9
4	---	11	---	---	---	---	---	232	268	82	14	5.8
5	---	9.6	---	---	---	---	---	213	240	66	13	6
6	---	8.4	---	---	---	---	---	239	220	65	12	6.4
7	---	8.7	---	---	---	---	---	306	203	50	12	6.5
8	e9.2	10	---	---	---	---	---	325	187	43	10	8.2
9	8.4	10	---	---	---	---	---	303	168	40	9.8	8
10	9	11	---	---	---	---	---	297	170	37	9.4	6.5
11	8.3	10	---	---	---	---	---	310	214	36	8.5	6
12	12	10	---	---	---	---	---	361	195	40	8.3	5.7
13	11	10	---	---	---	---	---	401	162	37	8.3	5.7
14	9.6	9.9	---	---	---	---	---	358	147	35	8.9	6.4
15	10	e10	---	---	---	---	---	369	156	31	12	9.8
16	10	e10	---	---	---	---	---	385	161	29	12	11
17	10	e10	---	---	---	---	---	397	133	27	10	8.4
18	10	e10	---	---	---	---	---	432	124	25	9.1	6.9
19	9.8	---	---	---	---	---	---	483	127	24	8.4	6.7
20	10	---	---	---	---	---	---	485	112	25	8	6.6
21	11	---	---	---	---	---	---	462	108	25	7.3	8.3
22	10	---	---	---	---	---	e244	408	98	22	6.4	9.8
23	8.2	---	---	---	---	---	287	396	88	20	6.4	9.8
24	10	---	---	---	---	---	327	432	82	19	6.8	11
25	11	---	---	---	---	---	295	433	77	18	7.6	10
26	11	---	---	---	---	---	266	381	94	19	7.7	9.2
27	10	---	---	---	---	---	191	341	91	19	7.5	8.3
28	11	---	---	---	---	---	173	308	70	18	6.9	7.6
29	10	---	---	---	---	---	200	286	62	17	6.6	7.3
30	10	---	---	---	---	---	219	272	56	16	6.5	8.3
31	9.7	---	---	---	---	---	---	267	---	16	6.6	---
TOTAL	239.2	180.5	---	---	---	---	2202	10543	4615	1072	302.0	228.6
MEAN	9.97	10	---	---	---	---	245	340	154	34.6	9.74	7.62
AC-FT	474	358	---	---	---	---	4370	20910	9150	2130	599	453
MAX	12	12	---	---	---	---	327	485	274	82	21	11
MIN	8.2	8.4	---	---	---	---	173	203	56	16	6.4	5.7

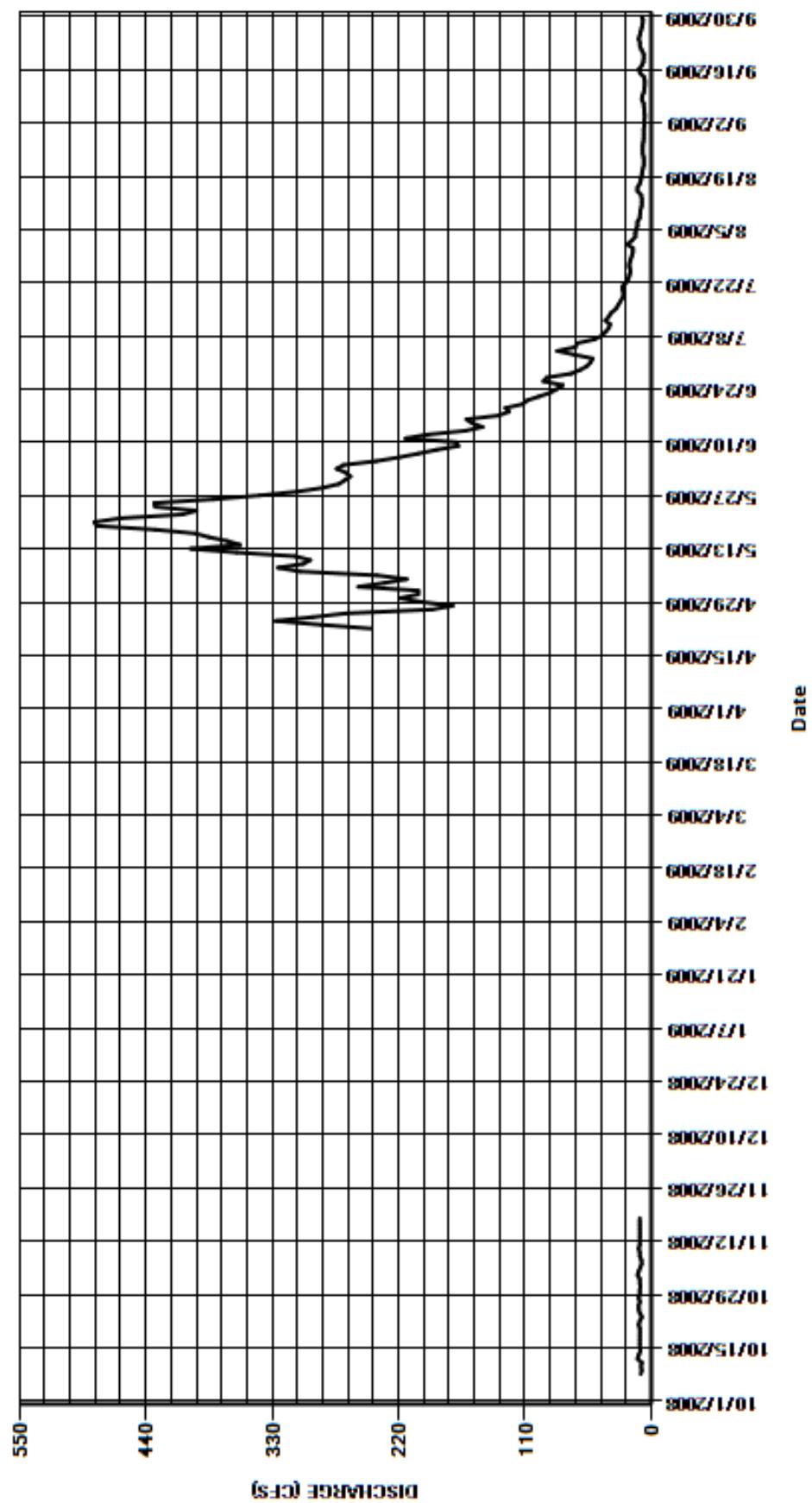
CAL YR	2008	TOTAL	419.7	MEAN	9.99	MAX	12	MIN	8.2	AC-FT	832 (PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	19382.3	MEAN	95	MAX	485	MIN	5.7	AC-FT	38440 (PARTIAL YEAR RECORD)

MAX DISCH: 526 CFS AT 22:00 ON May. 20,2009 GH 4.7 FT. SHIFT -0.05 FT. (GH CORR. +0.01 FT. APPLIED)

MAX GH: 4.7 FT. AT 22:00 ON May. 20,2009 (GH CORR. +0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MORRISON CREEK BELOW SILVER CREEK
WY2009 HYDROGRAPH



YAMPA RIVER BASIN
YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS
Water Year 2009

Location.--	Lat. 40°20'27", Long. 106°48'29", (Blacktail Mountain, Colorado Quadrangle), SE1/4 of the SE1/4 in Section 33, T5N, R84W of the Sixth Principal Meridian in Routt County, at County Road 18C bridge.
Drainage and Period of Record.--	361 sq mi (from topographic maps). State Engineer maintained station. Staff gage installed at current site and datum. Spot records from staff gage kept from April 1989 to October 2003 with some years with record dating back to 1978. Continuous hydrographic records kept from October 2003 to present.
Equipment.--	Sutron shaft encoder Model 5600-0531 housed in a 42-inch diameter corrugated metal pipe. The shaft encoder is connected to a high data rate Sutron Satlink data collection platform (DCP) with satellite telemetry. Stilling well equipped with two 1.5-inch intakes connected to risers. The inside staff, with a range of approximately 0.00 to 6.66 feet, is the primary reference gage and is located on the inside wall of the pipe.
Hydrographic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain up in the Flattops Wilderness Area. Discharge affected by storage and subsequent releases of Yampa River flows from Stagecoach Reservoir approximately 5 miles upstream. The channel slope is moderate and consists of small gravel and rock. Channel is straight for approximately 100 feet upstream and 500 feet downstream with a slight bend as the river passes under the bridge.
Gage-Height Record.--	Primary record is hourly data developed from the DCP data log of 15-minute observations. Continuous record kept from October 1, 2008 to September 30, 2009. The record is complete and reliable except for the following ice-affected days: December 5, 9-12, 15, 24, 25, 27, 28, 30, and 31, 2008; and, January 1, 4-7, 16-22, and 31; February 1, 2, 4-6, 10, 12, 15, 16, 20-22, and 28; and, March 1, 8, 9, 11-16, 27 and 28, 2009 and the following inaccurate gage height days (due to tank heater malfunction, float beginning to freeze in stilling well, tape slippage): December 16-21, 2008 and January 27-30, 2009. Discharge values for these dates were estimated as described below under "Special Computations". Shaft encoder/flush and datum corrections were made either at the time of site visit or upon development of the record and ranged in value from -0.02 to +0.06 ft. Gage heights are recorded throughout the winter months; however, the river can be partially frozen, which in turn may result in the record being affected by ice conditions. The stilling well is generally kept ice free through use of a stock tank heater. Due to severe conditions, the heater malfunctioned and was replaced on January 30, 2009.
Datum Corrections.--	Levels were not run in WY2009. Levels were last run on August 27, 2008 using the staff gage as the reference. Three other benchmarks were established at the time (RM1, RM2, and RM3).
Rating.--	Channel itself acts as the control. The right and left banks are steep and are about 6 to 8 feet high, above which flow would become sheet flow throughout a wide floodplain. Rating No. 12, in use since May 16, 2008, was used the entire water year. It is well defined to flows of 2,500 cfs, 150% of the historical highest discharge measurement made in WY2008. Fourteen measurements (numbers 148 through 161), ranging in discharge from 55.8 to 1050 cfs, were taken in WY 2009. These measurements covered the range in discharge except for higher daily flow on May 15-25, 2009 and lower daily flow on October 2-10 and November 7, 2008. The peak instantaneous flow of 1380 cfs occurred on May 19, 2009 at 23:15 at a gage height of 4.90 ft, with a shift of -0.05 ft. This peak exceeded the stage of measurement 156 made on May 23, 2009 by 0.50 ft. Minimum daily flow of 52 cfs occurred on October 3, 4, and 10, 2008.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from October 1, 2008 – January 21 (15:00), 2009 and August 13(10:00) – September 30, 2009. Shift curve VAR2009 was applied from January 21 (16:00) - August 13 (09:00), 2009. Open-water measurements showed shifts varying between -0.06 and +0.03 feet. Shifts were applied directly and given full weight, except for Measurements No. 148, 149, 152, 155, and 158, which were discounted from -4% to +3% to smooth shift distribution.
Special Computations.--	Discharge values were estimated for those days affected by ice and inaccurate gage height. Estimated discharge values were computed by interpolation between adjacent good record, consideration of temperature and precipitation data from the Colorado Climate Center (Steamboat Springs, CO), and by comparison to discharge record from the USGS operated and maintained gage station located upstream approximately 5 miles on the Yampa River below Stagecoach Reservoir.
Remarks.--	The record is good except for periods affected by ice (December 5, 9-12, 15, 24, 25, 27, 28, 30, and 31, 2008; and, January 1, 4-7, 16-22, and 31; February 1, 2, 4-6, 10, 12, 15, 16, 20-22, and 28; and, March 1, 8, 9, 11-16, 27 and 28, 2009) and inaccurate gage height (December 16-21, 2008 and January 27-30, 2009), in which the data were estimated. These data points are considered fair to poor.
Recommendations.--	Rating No. 12 was developed after the extreme spring 2008 runoff conditions resulted in channel scouring. This rating should continue to be revisited as additional measurements are made and data points become available. Gage operated and maintained and record developed by Jean Ray.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS

RATING TABLE--

YAMABVCO12 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	64	59	58	e80	e95	e85	100	506	756	215	118	65
2	53	61	58	80	e95	85	103	545	746	231	117	65
3	52	66	58	80	96	87	99	689	764	260	112	65
4	52	65	58	e75	e95	89	96	646	809	328	141	65
5	53	63	e57	e75	e95	93	101	605	723	313	188	65
6	54	58	57	e75	e95	105	114	671	658	317	156	66
7	55	55	58	e75	95	104	117	849	611	283	106	66
8	53	63	57	79	95	e100	127	919	584	249	102	68
9	53	61	e57	77	96	e95	144	852	535	221	97	68
10	52	66	e65	80	e95	89	148	830	527	201	97	67
11	56	80	e74	78	96	89	164	878	675	188	92	65
12	62	80	e73	80	e95	e80	172	999	644	202	90	64
13	62	79	74	81	94	e75	179	1030	577	202	89	64
14	57	78	76	80	94	e75	194	1030	524	194	90	65
15	57	71	e74	83	e95	e75	211	1070	522	180	94	69
16	58	77	e74	e80	e90	e70	244	1100	555	167	98	76
17	59	76	e74	e75	86	68	221	1110	485	156	94	72
18	57	76	e73	e75	89	71	205	1170	461	147	92	68
19	56	76	e73	e75	88	76	194	1270	464	139	91	67
20	58	76	e74	e75	e88	81	216	1290	414	141	89	67
21	60	75	e74	e75	e88	89	311	1230	392	143	81	70
22	60	72	75	e75	e88	103	463	1120	358	134	77	74
23	57	73	74	75	88	115	547	1070	324	128	69	74
24	59	72	e74	74	88	104	598	1100	295	122	70	74
25	60	71	e74	75	88	100	588	1130	280	119	70	72
26	61	66	73	74	85	94	596	1050	319	119	71	64
27	60	56	e74	e75	85	e92	485	938	353	121	70	61
28	60	57	e74	e75	e85	e91	455	867	286	119	69	59
29	60	57	72	e80	---	93	485	838	251	117	66	57
30	60	57	e77	e95	---	100	526	790	232	114	66	56
31	59	---	e82	e95	---	97	---	768	---	114	66	---
TOTAL	1779	2042	2145	2426	2562	2770	8203	28960	15124	5684	2928	1998
MEAN	57.4	68.1	69.2	78.3	91.5	89.4	273	934	504	183	94.5	66.6
AC-FT	3530	4050	4250	4810	5080	5490	16270	57440	30000	11270	5810	3960
MAX	64	80	82	95	96	115	598	1290	809	328	188	76
MIN	52	55	57	74	85	68	96	506	232	114	66	56

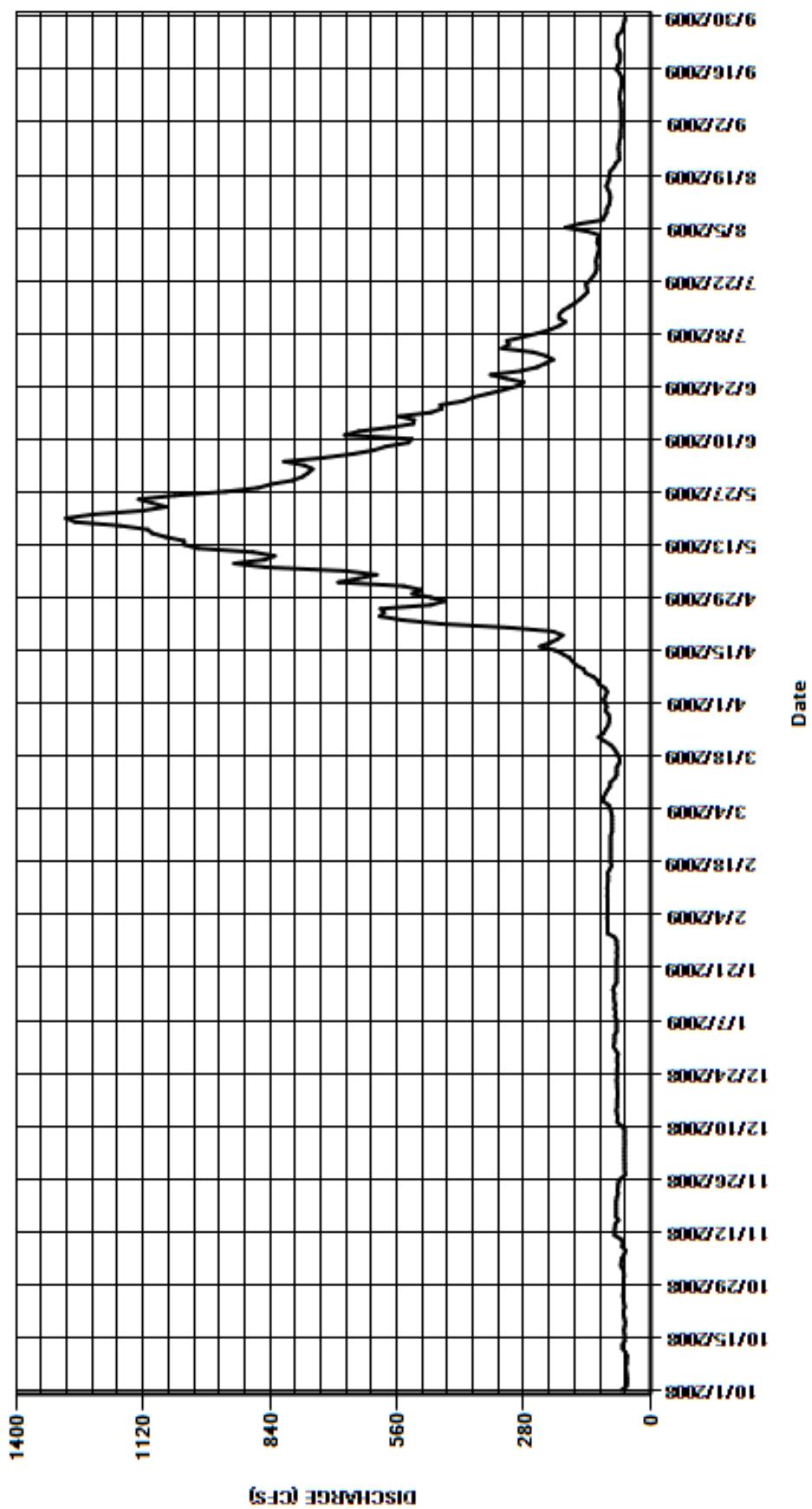
CAL YR	2008	TOTAL	89049	MEAN	243	MAX	1680	MIN	52	AC-FT	176600
WTR YR	2009	TOTAL	76621	MEAN	210	MAX	1290	MIN	52	AC-FT	152000

MAX DISCH: 1380 CFS AT 23:15 ON May. 19,2009 GH 4.9 FT. SHIFT -0.05 FT.

MAX GH: 4.9 FT. AT 23:15 ON May. 19,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

YAMPARABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS
WY2009 HYDROGRAPH



YAMPA RIVER BASIN
09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.
Water Year 2009

Location.--	Lat. 40 24'29", long. 106 47'11", , (Steamboat Springs, Colorado, Quad., scale, 1:24,000), in SW1/4 of the NW1/4, in Section 11, T5N, R84W, (projected), Routt County, on left bank 0.4 miles downstream from Beaver Creek, 0.6 miles downstream from Storm King Creek, 4.5 miles upstream from its confluence with the Yampa River, and 6.0 miles southeast of Steamboat Springs.
Drainage and Period of Record.--	42.4 sq mi (from topographic maps)
Equipment.--	Sutron shaft encoder (SDI12) connected to a Sutron HDR data collection platform (DCP) with satellite telemetry. The encoder and DCP are housed in a 42-inch diameter corrugated metal shelter and well. The station is equipped with two 2-inch intakes connected to risers. Primary reference gage is an inside staff (range of 0.00 to 6.6 ft.) located on inner wall of 42-inch diameter corrugated metal well. An adjustable brass screw/nut on the edge of the equipment shelf is the secondary reference gage but was not used this water year. The control is a broad-crested concrete weir 50-foot long with a low flow section on the left side.
Hydrographic Conditions.--	The basin above the gage is 42.4 square miles consisting of steep mountainous terrain originating at the top of Mount Werner and Walton Peak. Channel slope is steep at gage location and consists of large boulders (up to approximately 3-4 feet in diameter) typical of mountainous streams. The channel is straight for 200-feet upstream to 200-feet downstream of the gage, which is located immediately upstream of the weir. The right bank is high and less subject to overflow than the left bank. Some development has occurred in the vicinity of the gage, and a large home is currently under construction above the gage location.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data. Continuous gage height records were kept from October 1 to November 15, 2008 and April 20 to September 30, 2009. Records were not kept during the winter period (November 16, 2008 to April 19, 2009), due to site accessibility and frozen channel issues. The record is complete and reliable except for the following dates: November 15, 2008 and April 20, 2009, which were partial shut-down and start-up days and November 14 and 15, 2008, which were ice-affected. No shaft encoder/datum corrections were made at the time of site visit, nor upon development of the record.
Datum Corrections.--	Levels were not run in WY2009. Levels were last run on August 27, 2008 to establish an adjustable brass screw/nut on the edge of the equipment shelf in the shelter using RM-1 as the base. Three additional reference markers were established at the same time RM 5, 6 and 7. No corrections were made.
Rating.--	The control is a broad-crested concrete weir 50-foot long with a low flow section on the left side. This section is 9-feet wide at the downstream edge and 19-feet wide at the upstream edge. Rating No. 8, developed in November 2003, and extended in June 2007, was used in WY2009. Seven measurements (numbers 58 through 64) were made during the current water year, ranging in discharge from 8.47 to 49.8 cfs. They cover the range in stage experienced except for higher daily flows April 22 to July 15, 2009; and lower daily flows October 1-3, 10, and 17, 2008 and August 23 and 27-31, and September 1-14, 17-19, and 27-29, 2009. There are no facilities available near the gage to make high flow measurements. The instantaneous peak flow of 1210 cfs occurred on June 3, 2009 at 19:15 at a gage height of 2.63 feet, with a shift of 0.01 feet and exceeded measurement No. 61, made on July 16, 2009 by 1.71 ft. in stage. Minimum daily flow of 6.8 cfs occurred on September 19, 2009.
Discharge.--	Shifting section control method was used throughout the period of record. Shifts were applied as defined by measurements and were distributed by time. This year's measurements had unadjusted shifts ranging between -0.03 to 0.01feet. Shifts were given full weight and applied directly except for measurements No. 58 and No. 63, which were discounted by -6% and -3%, respectively, to smooth shift distribution.
Special Computations.--	The station is closed during the winter months and no discharges are estimated during this period. Discharge data for November 15, 2008 (shut-down) and April 20, 2009 (start-up) were estimated using flow measurement data, partial day DCP data, and consideration of adjacent good data. Estimated discharge values for ice-affected days (November 14-15, 2008) were computed by interpolation between adjacent good record and consideration of temperature and precipitation data from the Colorado Climate Center (for Steamboat Springs, CO).
Remarks.--	The record is good except as follows: November 14-15, 2008 and April 20, 2009, which were estimated and should be considered fair to poor; and April 24 – July 7, 2009, which should also be considered fair to poor because the flow exceeded twice the highest WY2009 measurement. Because this gage station is used for water administration purposes only, the rating is considered more critical during low flow periods.
Recommendations.--	Due to high stream velocities/depth of flow, it is highly recommended that no stream flow measurements be waded above a gage height of 1.20 feet, that chest waders be worn above a gage height of 1.00 feet, and that a second person must be on site for safety reasons. Measurements on the weir should take into account angular flow. The broad-crested weir is wide enough to take reliable measurements at its upstream edge, though safety must be considered when on the weir. A drop tape needs to be constructed and installed. The adjustable brass nut and drop tape will become the primary reference. Gage operated and maintained and record developed by Jean Ray.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.

RATING TABLE--

WLTNCKCO08 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.1	13	---	---	---	---	---	134	690	155	30	7.7
2	8.3	14	---	---	---	---	---	144	676	189	20	7.6
3	8.3	17	---	---	---	---	---	184	807	167	17	7.8
4	8.7	18	---	---	---	---	---	162	713	148	16	7.7
5	11	13	---	---	---	---	---	140	625	139	14	7.5
6	13	10	---	---	---	---	---	161	579	117	15	7.5
7	10	12	---	---	---	---	---	223	448	101	17	7.6
8	9.4	14	---	---	---	---	---	247	410	86	13	7.6
9	8.7	14	---	---	---	---	---	233	405	76	12	7.7
10	8.3	16	---	---	---	---	---	247	438	68	12	7.6
11	8.5	16	---	---	---	---	---	283	528	68	12	7.3
12	16	16	---	---	---	---	---	326	444	87	11	6.9
13	11	17	---	---	---	---	---	318	391	73	11	7.1
14	9	e15	---	---	---	---	---	313	372	70	11	7.7
15	9.1	e13	---	---	---	---	---	379	347	55	14	9.5
16	8.8	---	---	---	---	---	---	444	316	49	15	14
17	8.4	---	---	---	---	---	---	522	305	45	12	8.2
18	8.8	---	---	---	---	---	---	614	378	40	11	7
19	8.9	---	---	---	---	---	---	690	352	37	10	6.8
20	9.2	---	---	---	---	---	e35	763	304	35	9.6	9.3
21	12	---	---	---	---	---	48	752	320	32	9.2	12
22	13	---	---	---	---	---	71	709	317	30	9.2	12
23	9.5	---	---	---	---	---	89	746	306	27	8.3	11
24	12	---	---	---	---	---	107	783	303	25	8.7	10
25	12	---	---	---	---	---	118	803	297	24	9.9	9.8
26	13	---	---	---	---	---	137	721	339	25	8.7	8.7
27	14	---	---	---	---	---	123	693	273	28	8.4	8.1
28	13	---	---	---	---	---	106	694	212	26	8.2	7.2
29	14	---	---	---	---	---	107	696	188	21	8	7.2
30	14	---	---	---	---	---	126	701	167	21	7.8	8.9
31	13	---	---	---	---	---	---	712	---	23	7.6	---
TOTAL	331.0	218	---	---	---	---	1067	14537	12250	2087	376.6	255.0
MEAN	10.7	14.5	---	---	---	---	97	469	408	67.3	12.1	8.5
AC-FT	657	432	---	---	---	---	2120	28830	24300	4140	747	506
MAX	16	18	---	---	---	---	137	803	807	189	30	14
MIN	8.1	10	---	---	---	---	35	134	167	21	7.6	6.8

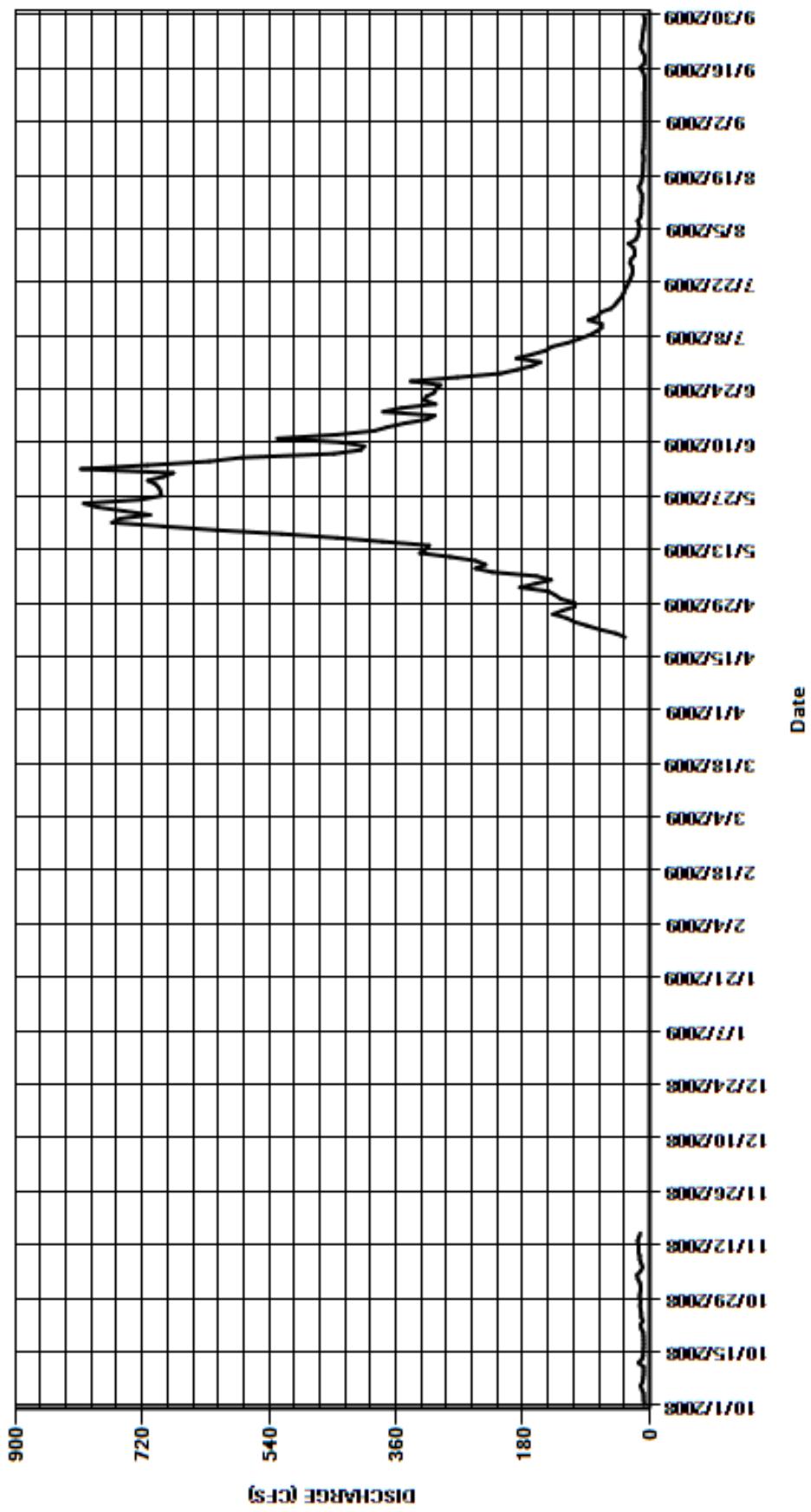
CAL YR	2008	TOTAL	31102.3	MEAN	154	MAX	847	MIN	8.1	AC-FT	61690 (PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	31121.6	MEAN	148	MAX	807	MIN	6.8	AC-FT	61730 (PARTIAL YEAR RECORD)

MAX DISCH: 1210 CFS AT 19:15 ON Jun. 03,2009 GH 2.63 FT. SHIFT 0.01 FT.

MAX GH: 2.63 FT. AT 19:15 ON Jun. 03,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.
WY2009 HYDROGRAPH



YAMPA RIVER BASIN
WILLOW CREEK BELOW STEAMBOAT LAKE
Water Year 2009

Location.--	Lat. 40 47'28", Long. 106 56'40", (Hahns Peak Quadrangle), in Section 29, T10N, R85W in Routt County, on left bank 50-feet below the Steamboat Lake outlet.
Drainage and Period of Record.--	Gage location is immediately downstream of reservoir outlet, thus flow is dictated by outlet opening position rather than drainage area runoff. The drainage area of Steamboat Lake is 35.5 square miles. 1979 to present
Equipment.--	Sutron shaft encoder (SDI12) housed in a steel box shelter on an 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located in a separate NEMA housing box several feet from the stilling well. There is no outside staff. Primary reference is a steel drop tape referenced to a non-adjustable screw set into the edge of wooden instrument shelf.
Hydrographic Conditions.--	The basin consists of steep mountainous terrain originating at the top of Sand Mountain, Diamond Peak, and other portions of the mountain range dividing the Elk River drainage and Little Snake River drainage. The channel slope is moderate at the gage and consists of small to medium size rock ranging from 4 to 12 inches in diameter. Releases from Steamboat Lake control the flow in Willow Creek.
Gage-Height Record.--	Primary record is 15-minute gage height data from the DCP. Record was kept from October 1 to October 29, 2008 (DCP shut-down for winter) and April 24 (DCP start-up in spring) to September 30, 2009. The reservoir outlet gate valve was closed on October 31, 2009 and values were estimated between October 29 and October 31, 2009. Releases from the reservoir were kept constant during this period. No water was released from the reservoir during the winter months (November 1, 2008 through April 23, 2009). The reservoir outlet gate valve was opened on April 24, 2009 at approximately 10:00 and the DCP was started for the season at approximately the same time. The outlet gage height record is complete and reliable except for the following days: October 29 to October 31, 2008 and April 24, 2009, which were estimated. No instrument datum corrections were necessary this water year.
Datum Corrections.--	Levels were run and benchmarks established on October 29, 2008. RM-1 is top of staff gage in old PVC well; based on historic gage height readings, the top of the staff gage plate, el = 4.330 ft. RM-2 is MagNail in left concrete outlet works wingwall on outside face near downstream end, el = 3.681 ft. RM-3 is MagNail in right concrete outlet works wingwall on downstream end, el = 3.890 ft. RM-4 is MagNail in top of boulder 4 ft streamward of gage equipment shelter, el = 5.179 ft. RP is non-adjustable screw set in edge of equip shelf; el = 6.323 ft. (use center of slot to tape) PZF elevation is -0.18 feet.
Rating.--	Control is a cobble/small boulder riffle located just downstream of the gage. Gage location is immediately downstream of the Steamboat Lake reservoir outlet and flow is controlled by the outlet valve opening position. The channel slope is moderate and consists of small to medium size rock ranging from 4 to 12 inches in diameter. Channel is straight for at least 100 feet downstream of the gage. The right and left banks are subject to overflow. Rating No. 12 began on October 1, 2008 and was used the entire period of record. It is well defined to flows of 240 cfs, 150% of the historical highest discharge measurement made in WY2005. Seven measurements (numbers 89 to 95) were taken ranging in discharge from 6.58 to 47 cfs. These measurements cover the range in discharge except for lower daily flows on October 1-11, 2008 and higher daily flows on April 24 to June 29, 2009. The instantaneous peak discharge of 340 cfs was recorded on April 24, 2009 at 12:00 at a gage height of 3.42 feet and exceeded the stage of Measurement no. 91, made on June 30, 2009, by 1.70 feet.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied directly and were distributed by time from October 1 through October 29, 2008 and April 24 through September 30, 2009. Open-water measurements showed raw shifts ranging between -0.03 and 0.04 feet. Measurements were given full weight, except for Measurements 89, 92, and 94, which were discounted 4%, -8%, and 4%, respectively, to smooth shift distribution.
Special Computations.--	No water is released from the reservoir during the winter months and no outlet record is kept. Estimated values for the period in which the outlet valve was open, but the DCP shut-down, were based upon previous good data (and the knowledge that the outlet gate valve remained unadjusted during this period).
Remarks.--	Record is considered good from October 1 to October 28, 2008 and June 19-September 30, 2009. The record is considered fair from April 24 to June 18, 2009 because the flow exceeded twice the highest WY2009 measurement. The record is also considered fair on days in which the flow was estimated (October 29-31, 2008 and April 24, 2009).
Recommendations.--	Reassess Rating No. 12, developed in WY 2009, and update if necessary. Run levels again and reassess the PZF and overbank conditions. Gage operated and maintained and record developed by Jean Ray.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILLOW CREEK BELOW STEAMBOAT LAKE

RATING TABLE-- WILBSLC012 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

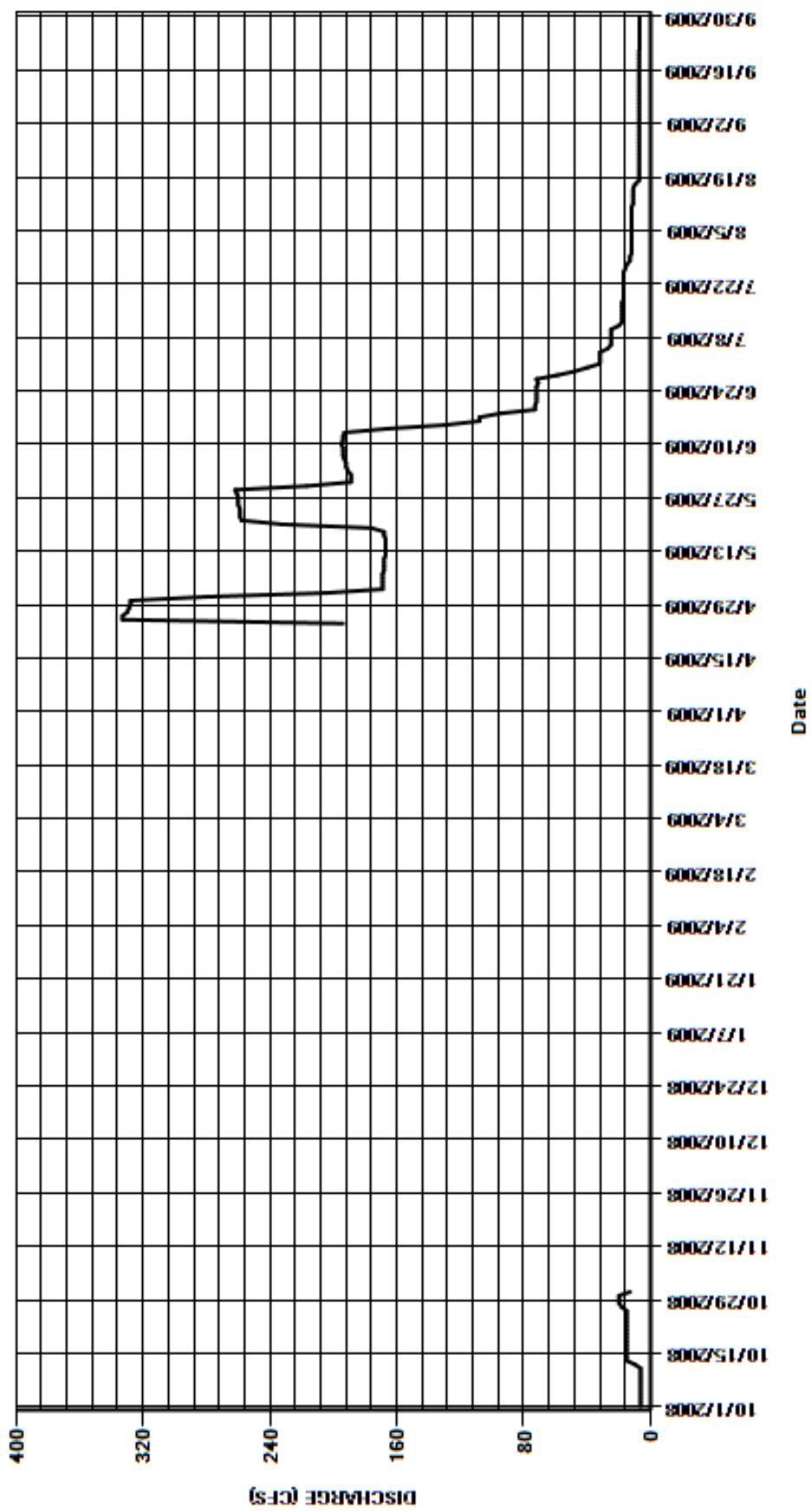
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.3	---	---	---	---	---	---	280	189	32	12	7.3
2	6.3	---	---	---	---	---	---	205	189	32	12	7.3
3	6.3	---	---	---	---	---	---	169	191	32	12	7.3
4	6.3	---	---	---	---	---	---	169	192	32	12	7.3
5	6.3	---	---	---	---	---	---	169	192	27	12	7.3
6	6.3	---	---	---	---	---	---	169	193	25	12	7.3
7	6.3	---	---	---	---	---	---	169	194	25	12	7.3
8	6.3	---	---	---	---	---	---	168	194	25	12	7.3
9	6.3	---	---	---	---	---	---	168	194	25	12	7.3
10	6.3	---	---	---	---	---	---	168	195	25	12	7.3
11	6.3	---	---	---	---	---	---	168	194	20	12	7.3
12	10	---	---	---	---	---	---	167	194	18	11	7.3
13	15	---	---	---	---	---	---	167	193	18	11	7.3
14	15	---	---	---	---	---	---	167	166	18	11	7.3
15	15	---	---	---	---	---	---	167	129	18	11	7.3
16	15	---	---	---	---	---	---	167	108	18	11	7.3
17	15	---	---	---	---	---	---	168	108	18	9.8	7.3
18	15	---	---	---	---	---	---	168	95	17	7.3	7.3
19	15	---	---	---	---	---	---	176	73	17	7.3	7.3
20	15	---	---	---	---	---	---	233	73	17	7.3	7.3
21	15	---	---	---	---	---	---	258	72	17	7.3	7.2
22	15	---	---	---	---	---	---	259	72	17	7.3	7
23	15	---	---	---	---	---	---	259	72	17	7.3	7
24	15	---	---	---	---	---	e194	259	72	17	7.3	7
25	15	---	---	---	---	---	333	260	72	17	7.3	7
26	15	---	---	---	---	---	333	260	71	16	7.3	7
27	18	---	---	---	---	---	330	260	72	15	7.3	7
28	20	---	---	---	---	---	329	261	59	13	7.3	7
29	e20	---	---	---	---	---	328	262	48	13	7.3	7
30	e20	---	---	---	---	---	328	217	40	12	7.3	7.1
31	e13	---	---	---	---	---	---	189	---	12	7.3	---
TOTAL	380.3	---	---	---	---	---	2175	6326	3906	625	299.0	216.3
MEAN	12.3	---	---	---	---	---	311	204	130	20.2	9.65	7.21
AC-FT	754	---	---	---	---	---	4310	12550	7750	1240	593	429
MAX	20	---	---	---	---	---	333	280	195	32	12	7.3
MIN	6.3	---	---	---	---	---	194	167	40	12	7.3	7
CAL YR	2008	TOTAL	16336.1	MEAN	82.1	MAX	357	MIN	6.2	AC-FT	32400	(PARTIAL YEAR RECORD)
WTR YR	2009	TOTAL	13927.6	MEAN	72.9	MAX	333	MIN	6.3	AC-FT	27630	(PARTIAL YEAR RECORD)

MAX DISCH: 340 CFS AT 12:00 ON Apr. 24,2009 GH 3.42 FT. SHIFT 0 FT.

MAX GH: 3.42 FT. AT 12:00 ON Apr. 24,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLOW CREEK BELOW STEAMBOAT LAKE
WY2009 HYDROGRAPH



YAMPA RIVER BASIN
WILLIAMS FORK AT MOUTH NEAR HAMILTON
Water Year 2009

Location.--	Lat. 40°26'14", Long. 107°38'50", in SE1/4 of the NW1/4 of Section 31, T6N, R91W, Moffat County, Hydrologic Unit 14050001, on left bank at coal mine service road crossing, 2,300 ft upstream from confluence with Yampa River, 6.1 mi north-northeast of Hamilton, and 8 mi south-southwest of Craig, CO.
Drainage and Period of Record.--	419 sq mi. Gage established and operated by USGS February 1, 1984 to September 30, 2001. Gage re-established by State Engineer's Office April 26, 2005.
Equipment.--	Sutron high data rate (HDR) data collection platform (DCP) driven by a Sutron constant flow bubbler (CFB) and powered by a solar recharged 12-volt battery housed in a 6-foot square shelter over a 4-foot culvert well (no longer in use). Outside gage (the primary reference gage) is a wire weight gage (WWG) mounted on the upstream side of the bridge almost directly above the orifice. To address sediment issues and continued orifice clogging, the muffler, which was originally installed in July 2007, was removed in July 2009.
Hydrographic Conditions.--	The basin consists of moderate terrain near the gage station but originates in steep mountainous terrain in the Flattops. In the vicinity of the gage station, the channel slope is moderate. The bed material is composed of small rock, cobbles, and occasional large boulders. The primary use of water upstream of the gage is irrigation.
Gage-Height Record.--	Primary record is the hourly average of the transmitted 15-minute satellite data with data from the DCP log used as backup. Continuous records were kept from October 1, 2008 through September 30, 2009. The record is complete and reliable except for the following days: December 6-17, 2008 due to ice conditions; May 22-July 10, 2009 due to unstable gage height readings (extreme noise/chatter), likely due to high flow and sediment load. Gage height calibration corrections for WY2009 were made either at the time of visit or upon development of the record and ranged from -0.07 to +0.09 feet.
Datum Corrections.--	Levels were run on July 29, 2009 using RM3 as base. The WWG was found to be reading high. The WWG and CFB were adjusted -0.06 feet at 12:25 on July 29, 2009. This datum correction was implemented by making concurrent corrections in the gage height and in the shift on July 29, 2009. Measurements used in rating analysis prior to this date will need to have the MGH of the measurement adjusted by -0.06 ft. A new reference mark, RM6, was established (elevation 16.038 ft.).
Rating.--	The shelter is located upstream of the bridge on the left abutment. The orifice is located slightly underneath the bridge at the left abutment. The stream approaches the gage from a moderate left bend 300 feet upstream; the reach is then fairly straight all the way downstream to the cobble riffle, low water control 300 to 400 feet downstream of the gage. The high water control is the bridge opening. Rating No. 7, created on February 9, 2006 (and extended on May 20, 2008 to include the high gage heights recorded in WY2008), was used throughout the entire water year. Twelve measurements, numbered 46 through 58, were taken during WY2009. Note that measurements 55 and 56 are the same measurement, with measurement 56 reflecting the -0.06 ft. datum correction applied after levels were run. Measurements ranged in discharge from 42.4 to 1040 cfs and covered the range in discharge, except for lower daily flows on October 1-4; November 7, 16, and 25; and, December 5, 10, 11, 15, and 16, 2008 and August 13, 14, and 19-31 and September 1-15 and 28-30, 2009; and higher daily flows on May 3, 6, 7, 13, 20, 21, and 24-26, 2009. The peak instantaneous flow of 1670 cfs occurred on May 7, 2009 at 04:00 at the peak gage height of 6.55 feet and a shift of 0.00 feet. The peak gage height exceeded the stage of Measurement 52 made May 6, 2009 by 0.98 ft.
Discharge.--	Shifting control method was applied throughout WY2009. Shifts were applied as defined by measurements and were distributed by time throughout the water year. Open-water measurements showed shifts varying between -0.02 and +0.06 feet. Shifts were applied directly and given full weight, except for Measurements Nos. 47, 49, 53, 54, and 58, which were discounted from -4% to -1% to smooth shift distribution. Shifts after adjustment ranged between 0.00 and +0.06 feet.
Special Computations.--	Discharge values were estimated for days of uncertain/unreliable gage height record (May 22-July 10, 2009) by consideration of weather data (temperature and precipitation) from the weather station in Craig; interpolation between spot values and previous and subsequent periods of good record; evaluation of the transmitted unstable gage height data; and use of actual flow measurement values during this period. Discharge values were also estimated for "b" (ice-affected) days (December 6-17, 2008) by consideration of weather data and previous and subsequent periods of good record.
Remarks.--	The record is good except for December 6-17, 2008 due to ice conditions and May 22 – July 10, 2009 due to unstable gage height readings (extreme noise/chatter). Discharge values were estimated during these periods and the record is considered poor for these dates. Gage operated and maintained and record developed by Jean Ray.
Recommendations.--	Levels should be re-run and the PZF reassessed in WY2010. In addition, Rating No. 7 should be re-evaluated, based upon the results of the second consecutive year of levels data. Measurements used in rating analysis prior to the July 29, 2009 levels and datum correction will need to have the MGH of the measurement adjusted by -0.06 ft.

STATE OF COLORADO
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WILLIAMS FORK AT MOUTH NEAR HAMILTON

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	65	79	64	48	60	68	82	790	2140	565	72	44
2	164	70	76	48	46	72	83	552	2230	527	69	68
3	135	58	99	50	48	76	89	435	2180	490	68	67
4	91	55	63	52	50	63	80	449	1980	450	68	54
5	80	57	68	54	56	67	93	536	1770	421	66	49
6	103	54	66	50	60	69	90	853	1610	397	70	46
7	87	50	64	48	68	61	90	1310	1690	384	90	45
8	73	50	67	52	68	70	90	1660	1440	332	106	45
9	65	51	70	52	66	75	92	1450	1320	290	119	46
10	63	51	66	50	68	68	96	1460	1330	264	113	50
11	56	51	62	50	72	72	84	1270	1500	234	108	63
12	53	50	56	50	78	68	79	1460	1130	211	100	95
13	50	50	52	52	74	58	89	1450	933	193	83	82
14	56	52	50	54	82	50	107	1450	1020	172	75	68
15	63	48	48	54	70	52	170	1440	1120	168	71	59
16	59	34	54	48	70	49	240	1500	1150	149	74	55
17	59	54	54	50	68	53	200	1720	1200	127	85	52
18	68	52	64	50	58	49	180	2210	1130	137	84	49
19	63	50	70	50	66	54	250	2340	1160	139	74	49
20	70	48	64	58	78	62	384	3620	1150	126	69	47
21	80	47	60	46	74	54	411	3330	1000	114	65	51
22	58	22	54	46	78	65	349	3060	943	114	60	58
23	75	15	54	50	78	68	430	2000	879	112	55	54
24	79	26	54	50	82	69	563	1520	868	109	52	50
25	80	30	54	58	76	88	436	1410	821	97	53	45
26	81	31	50	50	72	93	367	1490	819	90	49	43
27	80	36	48	52	68	121	310	1700	730	88	50	39
28	77	39	44	54	65	98	349	1920	687	85	47	36
29	72	28	48	82	---	102	502	1970	648	87	41	37
30	70	38	48	70	---	114	717	2110	604	82	38	34
31	79	---	50	74	---	116	---	1960	---	79	38	---
TOTAL	2354	1376	1841	1652	1899	2244	7102	50425	37182	6833	2212	1580
MEAN	75.9	45.9	59.4	53.3	67.8	72.4	237	1627	1239	220	71.4	52.7
AC-FT	4670	2730	3650	3280	3770	4450	14090	100000	73750	13550	4390	3130
MAX	164	79	99	82	82	121	717	3620	2230	565	119	95
MIN	50	15	44	46	46	49	79	435	604	79	38	34

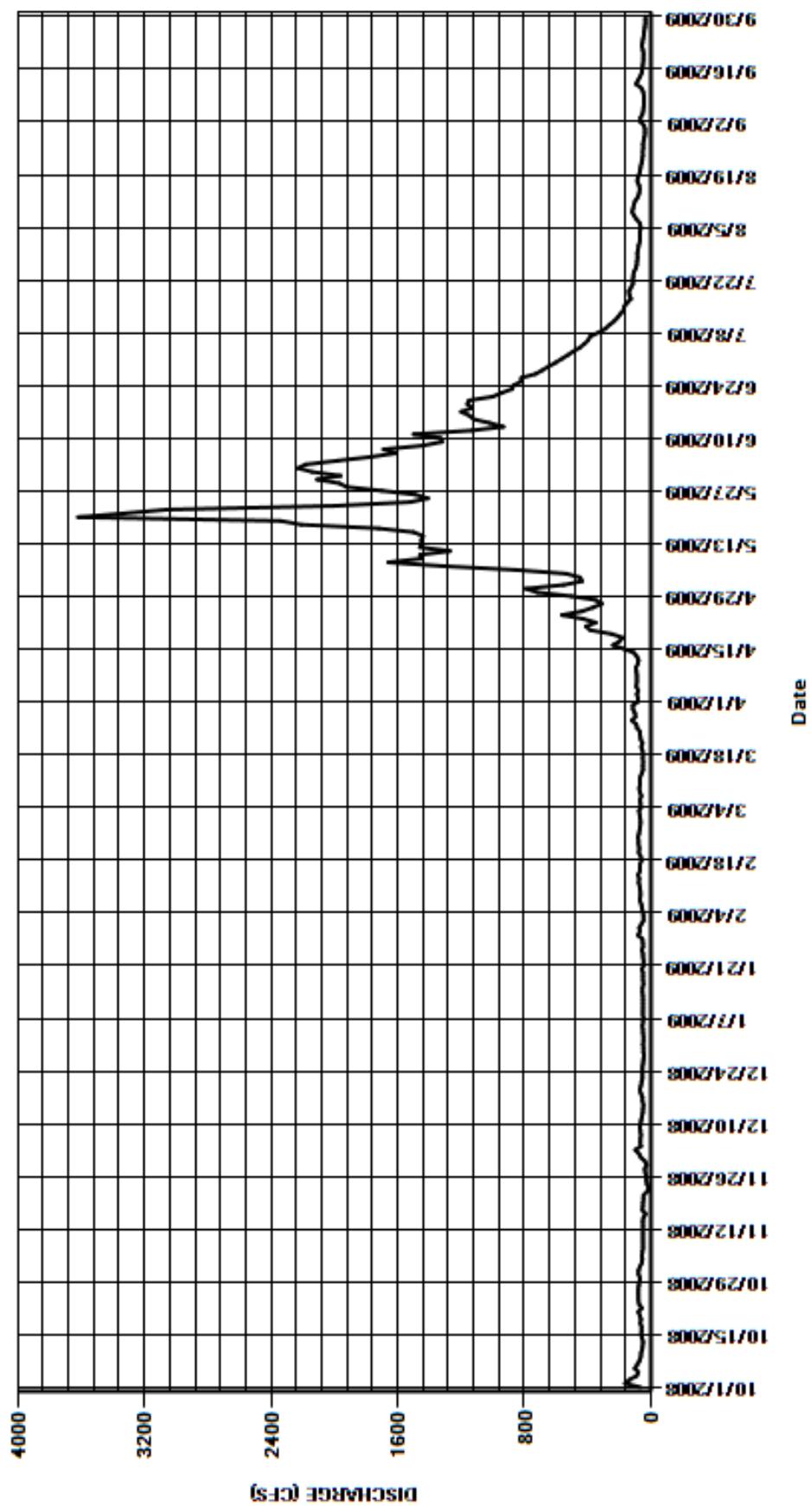
CAL YR	2008	TOTAL	116764	MEAN	319	MAX	3620	MIN	15	AC-FT	231600
WTR YR	2009	TOTAL	116700	MEAN	320	MAX	3620	MIN	15	AC-FT	231500

MAX DISCH: 4590 CFS AT 10:00 ON May. 20,2008 GH 9.82 FT. SHIFT 0 FT.

MAX GH: 9.82 FT. AT 10:00 ON May. 20,2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLIAMS FORK AT MOUTH NEAR HAMILTON
WY2009 HYDROGRAPH



GREEN RIVER BASIN
POT CREEK AT UTAH-COLORADO STATELINE
Water Year 2009

Location.--	Lat. 40°40'25", Long. 109°03'03", (Hoy Mountain, Utah-Colorado Quadrangle), in Section 1, T2S, R25E Salt Lake Meridian in Daggett County, on left bank approximately 0.2 miles upstream from the Utah-Colorado state line.
Drainage and Period of Record.--	107sq mi (from topographic maps). Established September 1, 1957 by the USGS; USGS discontinued site September 30, 1982; re-established Summer 1983 by the State Engineer's Office. Staff gage installed inside well by USGS. Two outside staff gages, one on each bank, installed by State Engineer's Office.
Equipment.--	Sutron Shaft Encoder 5600-0530, housed in a 42-inch diameter corrugated metal pipe on left bank, connected to a high data rate Sutron Satlink data collection platform (DCP) with satellite telemetry. Well is equipped with two 2-inch intakes with standard inside flushing devices. The primary reference gage is a staff gage inside stilling well. Supplemental outside staff gages are located on left and right banks but are not used for reference purposes. Backup chart recorder not operational in WY2009.
Hydrographic Conditions.--	Basin consists of moderate terrain near the gage station and originates in steep mountainous terrain in the Diamond and Uintah Mountain ranges. In the vicinity of the gage station, the channel slope is moderate with some sinuosity. The streambed is composed of sandstone and silt.
Gage-Height Record.--	Primary record is hourly data developed from the DCP data log of 15-minute observations. Continuous record kept from October 1, 2008 through September 30, 2009. The gage station was visited on 2 separate occasions to ensure the instruments remained calibrated. No instrument corrections were necessary this water year. Record is complete and reliable.
Datum Corrections.--	Levels have never been run by DWR personnel at this gage.
Rating.--	The control consists of an artificial weir type structure consisting of sandstone rocks grouted in place. Water pools in weir to a gage height of 0.50 feet and flow begins at 0.51 feet. Channel is straight for 100-feet upstream and bends to the left just below control before straightening for 150 feet downstream. Left bank is subject to overflow at higher stages. Right bank is almost vertical sandstone rock. Left bank covered with sagebrush and other native vegetation. This site is dry most of the year and the creek generally flows only in response to storm events, during the spring runoff period, and at times when water is released from upstream reservoirs in Utah. Due to weather constraints, the site is inaccessible during most of the year, including the late fall, winter and early spring months, which includes most periods when flow is recorded at the site. Rating No. 6 was created on November 16, 2005 and used for WY2009. Flow was recorded at the site on 38 days during WY2009: February 24-25; March 3-4; April 26-28; May 2-4 and 16-31; and June 1-12, 2009. Zero flow (327 days) was recorded on the remaining days in WY2009. One measurement (#20) was made this year on May 19, 2009 at a flow of 3.53 cfs. An observation of zero flow was made on October 2, 2008. Measurements and observation of zero flow cover the range in stage, except for higher daily flows recorded on May 21 – June 3 and June 8, 2009. A peak flow of 7.31 cfs occurred on February 25, 2009 at 15:45 at a gage height of 1.1 ft. and a shift of 0.00 ft exceeded the high flow measurement by 0.11 ft.
Discharge.--	Shifts were distributed by time throughout WY2009, based upon Measurement 19 from WY2008 and observed zero flow in WY2009. Measurement 20 with a shift of +0.02 ft. was not used for shift distribution, because the measurement was rated fair to poor (due to windy conditions and grass in the channel, potentially affecting the measurement). It was determined that Measurement 20 might not be an accurate a portrayal of the control conditions.
Special Computations.--	No discharges were estimated during the flow period of WY2009.
Remarks.--	The record is considered fair throughout the record period, because only one flow measurement could be made during WY2009. Matt Warner, Calder and Crouse Reservoirs, located in Utah, all capture and control flow in Pot Creek upstream of gage. Irrigation diversions occur both upstream and downstream of the gage station and the river is subject to administration. No calls were honored on Pot Creek this year, however, releases were made from Crouse Reservoir between May 13 and June 5, 2009.
Recommendations.--	Levels need to be run at this site. Shelter platform needs to be rebuilt. Gage operated and maintained and record developed by Jean Ray.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

POT CREEK AT UTAH-COLORADO STATELINE

RATING TABLE--

PTCKSLCO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	6.3	0	0	0
2	0	0	0	0	0	0	0	0.05	4.4	0	0	0
3	0	0	0	0	0	0.02	0	0.18	4	0	0	0
4	0	0	0	0	0	0.01	0	0.08	3.1	0	0	0
5	0	0	0	0	0	0	0	0	3	0	0	0
6	0	0	0	0	0	0	0	0	3	0	0	0
7	0	0	0	0	0	0	0	0	2.9	0	0	0
8	0	0	0	0	0	0	0	0	4.1	0	0	0
9	0	0	0	0	0	0	0	0	2.1	0	0	0
10	0	0	0	0	0	0	0	0	0.38	0	0	0
11	0	0	0	0	0	0	0	0	0.26	0	0	0
12	0	0	0	0	0	0	0	0	0.04	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0.18	0	0	0	0
17	0	0	0	0	0	0	0	2.1	0	0	0	0
18	0	0	0	0	0	0	0	2.6	0	0	0	0
19	0	0	0	0	0	0	0	2.9	0	0	0	0
20	0	0	0	0	0	0	0	3.2	0	0	0	0
21	0	0	0	0	0	0	0	3.7	0	0	0	0
22	0	0	0	0	0	0	0	4.1	0	0	0	0
23	0	0	0	0	0	0	0	5.2	0	0	0	0
24	0	0	0	0	0.23	0	0	6.4	0	0	0	0
25	0	0	0	0	0.42	0	0	6.4	0	0	0	0
26	0	0	0	0	0	0	0.15	6.2	0	0	0	0
27	0	0	0	0	0	0	0.3	5.9	0	0	0	0
28	0	0	0	0	0	0	0.04	5.7	0	0	0	0
29	0	0	0	0	---	0	0	5.7	0	0	0	0
30	0	0	0	0	---	0	0	5.6	0	0	0	0
31	0	---	0	0	---	0	---	5.7	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.65	0.03	0.49	71.89	33.58	0.00	0.00	0.00
MEAN	0	0	0	0	0.023	0.001	0.016	2.32	1.12	0	0	0
AC-FT	0	0	0	0	1.3	0.06	1	143	67	0	0	0
MAX	0	0	0	0	0.42	0.02	0.3	6.4	6.3	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

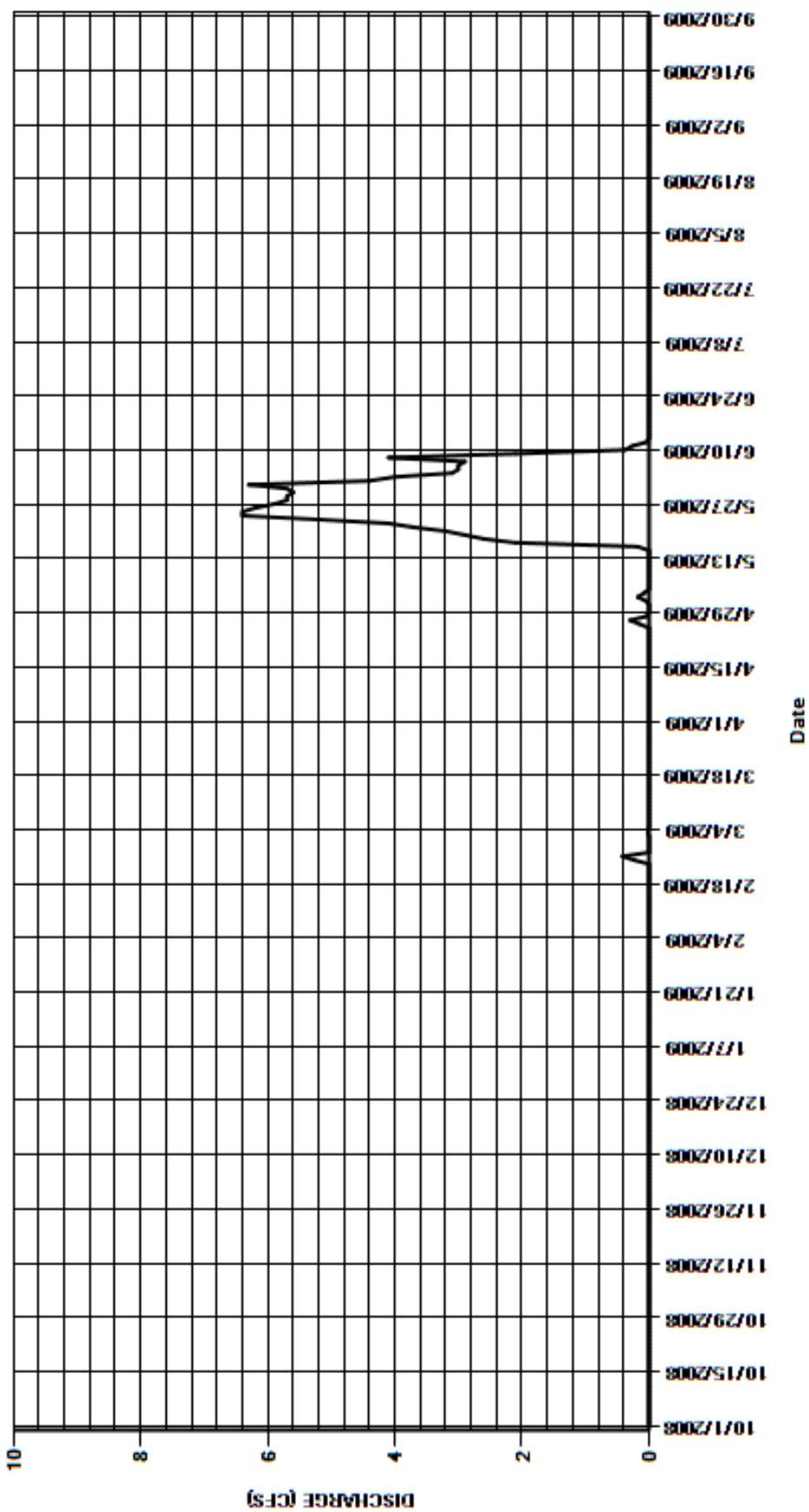
CAL YR	2008	TOTAL	73.01	MEAN	0.2	MAX	9.1	MIN	0	AC-FT	145
WTR YR	2009	TOTAL	106.64	MEAN	0.29	MAX	6.4	MIN	0	AC-FT	212

MAX DISCH: 7.3 CFS AT 15:45 ON Feb. 25,2009 GH 1.1 FT. SHIFT 0 FT.

MAX GH: 1.1 FT. AT 15:45 ON Feb. 25,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

POT CREEK AT UTAH-COLORADO STATELINE
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
DOLORES TUNNEL OUTLET NEAR DOLORES
Water Year 2009

Location.--	Lat. 37°28'00", Long. 108°32'30", in SW¼SE¼ sec. 18, T. 37 N., R.15 W., NMPM, Montezuma County.
Drainage and Period of Record.--	N/A
Equipment.--	A Sutron Satlink 2 high data rate DCP with a shaft encoder in a concrete shelter and well. The DCP record is the primary record with satellite data used for backup purposes. An electric tape is the primary reference. Control is a 15 ft concrete Parshall flume.
Hydrographic Conditions.--	The tunnel outlet discharges into a straight vertical wall channel that is 25-ft wide. The converging section of the concrete Parshall flume is located approximately 80-ft downstream of the tunnel outlet. Surging occurs in the converging section due to the close proximity of the tunnel outlet to the Parshall flume.
Gage-Height Record.--	Primary record is hourly averages of 15 minute data taken from the DCP log. The record is complete and reliable.
Datum Corrections.--	Levels have not been run to the inside gage since the gage was installed. The datum corrections noted on the measurement sheets are corrections or confirmations of the shaft encoder readings and flush corrections made as a result of visits to the gage by State of Colorado hydrographers.
Rating.--	The control is a 15 foot concrete Parshall flume. Moss and gravel in the flume cause shifting. Rating 02, dated Nov. 1, 2004, was used the entire water year. It is fairly well defined from 80 cfs to 356 cfs. Eight measurements, Nos. 76 - 83, were made this year ranging in discharge from 3.69 cfs to 356 cfs. They cover the range-in-stage experienced except for the lower daily flows of Nov. 11 - 13, 17, Dec. 2 - 4, 8 – 31, 2008; Jan. 1 - 16, 19 - 21, 24 – 26, Feb. 4,10 – 16, 18 – 28, Mar. 1, 2, 5 – 7, 9 – 18, 2009, and higher average daily flows of May 12 – 19, Jul 16 - 23, 2009. The peak discharge for the year of 405 cfs occurred at 1715 on May 13, 2009, at a gage height of 3.23 ft., and a shift of 0.06 ft. The gage height at that time exceeded the gage height of measurement No. 81 by 0.26 ft in stage. The max instantaneous gage height of 5.42 ft. occurred on June 13, 2009 at 0900. This gage height is likely the result of backwater from downstream gate adjustments and does not reflect actual flow through the Parshall flume.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by stage. Shift curve DOLTUNCOVS09A was used for the entire water year. Open-water measurements showed shifts varying from -0.04 to 0.06 feet. Shifts were applied directly and given full weight, except for measurement numbers 78, 79, and 82, which were discounted to smooth the shift curve. Measurement number 77 was not used as the shift of -0.20 ft was not a reasonable shift. Downstream gate settings were likely the cause of this unreasonable shift. Measurement No. 81 was the high flow measurement for the water year. This measurement was a conventional measurement and rated good.
Special Computations.--	No special computations were needed this water year.
Remarks.--	Record good.
Recommendations.--	Levels should be run in water year 2010. Gage maintained by the Dolores Conservancy District and record developed by Jason Morrow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DOLORES TUNNEL OUTLET NEAR DOLORES

RATING TABLE--

DOLTUNCO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

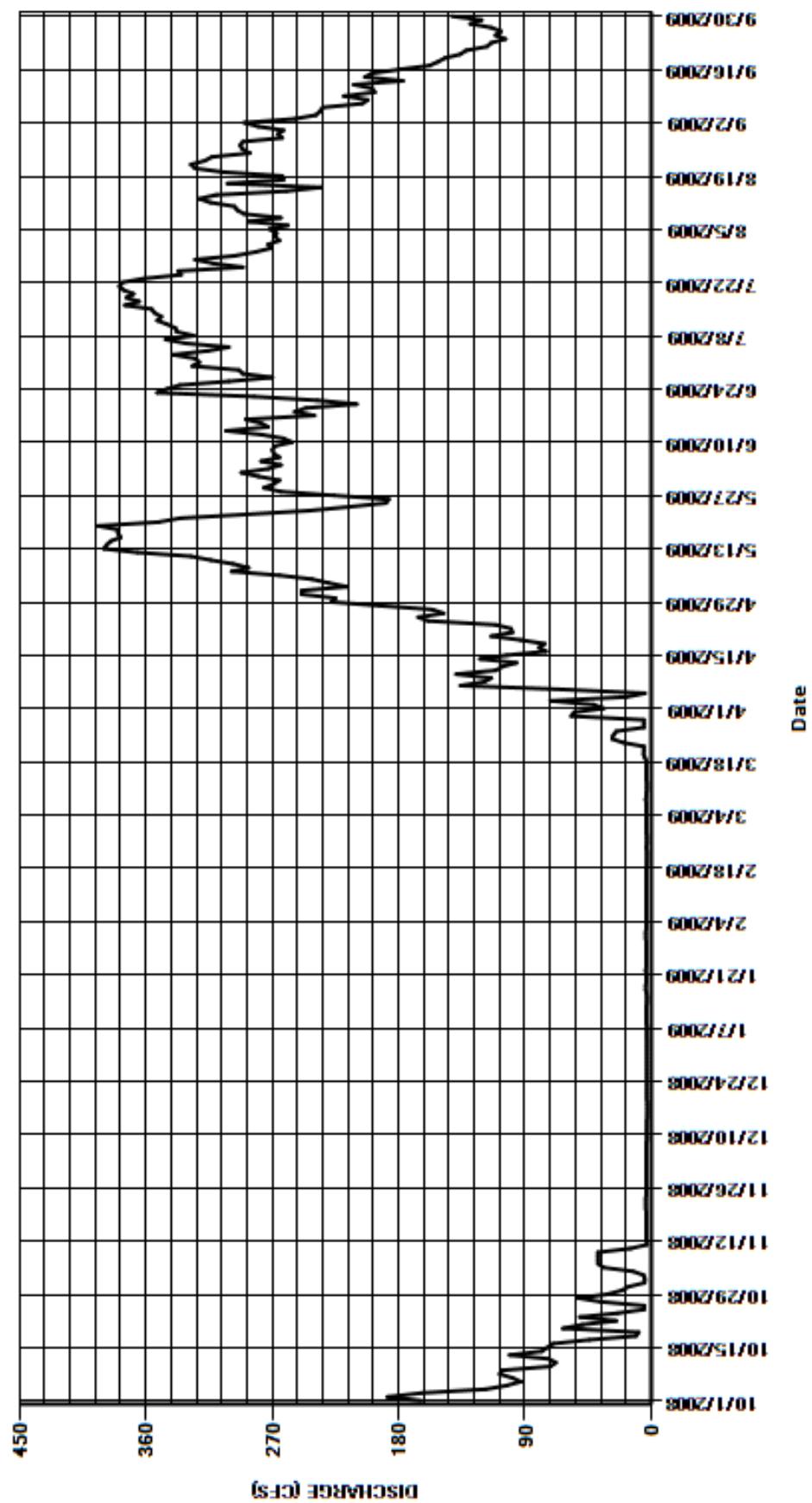
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	164	4.8	3.7	3.1	4	3.4	34	249	280	322	273	280
2	188	4.6	3.5	3.1	3.7	3.5	41	249	292	325	265	290
3	164	5.5	3.4	3.1	3.7	3.7	72	217	273	341	268	254
4	118	13	3.5	3.1	3.6	3.7	18	230	264	316	267	239
5	103	34	3.7	3.3	3.7	3.5	4.5	242	278	301	272	236
6	93	38	3.7	3.3	3.7	3.4	63	265	265	332	259	234
7	99	38	3.7	3.3	3.7	3.5	136	299	269	346	287	206
8	108	38	3.4	3.4	3.7	4	119	287	270	326	264	202
9	106	38	3.1	3.4	3.7	3.6	114	298	268	338	290	219
10	72	15	3.3	3.4	3.5	3.4	139	314	256	339	295	197
11	68	3.2	3.3	3.4	3.5	3.2	111	328	262	345	297	199
12	73	3.4	3.1	3.4	3.5	3.2	106	366	278	352	314	212
13	101	3.5	3.1	3.4	3.4	3.4	96	390	303	349	322	177
14	78	3.7	3.1	3.2	3.4	3.4	122	388	273	354	310	204
15	74	3.7	3	3.1	3.4	3.4	103	385	278	356	260	199
16	70	3.7	2.8	3.4	3.4	3.4	75	378	289	375	235	179
17	44	3.6	2.8	4	3.7	3.4	80	380	240	365	302	158
18	11	3.7	2.9	4	3.6	3.4	76	380	254	374	262	152
19	9	3.7	3.1	3.6	3.3	4.5	93	394	246	369	263	147
20	63	3.8	3.1	3.4	3.2	5.6	114	351	210	376	305	136
21	49	4	3.1	3.5	3.1	5.2	99	336	238	379	325	132
22	25	4	3.1	4	3.2	5.2	100	289	283	377	328	117
23	51	4	3.1	3.7	3.4	20	111	244	352	362	318	114
24	24	3.7	3.1	3.4	3.4	28	159	215	345	335	313	104
25	5	3.7	3.1	3.4	3.3	27	166	189	336	337	286	111
26	5	3.7	3.1	3.5	3.3	25	148	187	301	291	291	107
27	36	3.7	3.1	3.7	3.4	5.2	156	226	270	312	293	114
28	52	3.7	3.1	3.7	3.4	5.3	193	264	291	325	291	129
29	31	3.7	3.1	3.7	---	5.2	228	276	294	297	263	121
30	21	3.7	3.1	3.8	---	57	225	269	327	282	266	142
31	16	---	3.1	4	---	55	---	265	---	271	262	---
TOTAL	2121.0	302.8	99.4	107.8	97.9	310.7	3301.5	9150	8385	10469	8846	5311
MEAN	68.4	10.1	3.21	3.48	3.5	10	110	295	280	338	285	177
AC-FT	4210	601	197	214	194	616	6550	18150	16630	20770	17550	10530
MAX	188	38	3.7	4	4	57	228	394	352	379	328	290
MIN	5	3.2	2.8	3.1	3.1	3.2	4.5	187	210	271	235	104
CAL YR	2008	TOTAL	47220.5	MEAN	129	MAX	368	MIN	2.8	AC-FT	93660	
WTR YR	2009	TOTAL	48502.1	MEAN	133	MAX	394	MIN	2.8	AC-FT	96200	

MAX DISCH: 405 CFS AT 17:15 ON May. 13,2009 GH 3.23 FT. SHIFT 0.06 FT.

MAX GH: 5.42 FT. AT 09:00 ON Jun. 13,2009 (Backwater)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DOLORES TUNNEL OUTLET NEAR DOLORES
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
Water Year 2009

Location.--	Lat. 37°30'24", Long. 108°35'28", in NW¼SW¼ sec. 35, T.38 N., R.16 W., NMPM, Montezuma County.
Drainage and Period of Record.--	N/A
Equipment.--	A Sutron 8210 high data rate DCP and shaft encoder in a concrete block shelter. Shaft encoder is set to outside staff gage at the Ha location in the flume. Control is a 12-foot concrete Parshall flume.
Hydrographic Conditions.--	The canal is filled by gravity from McPhee Reservoir. The channel upstream and downstream of the Parshall flume is straight. At high flows ($GH > 2.50\text{-ft}$) the canal surges and the approach velocity to the flume is fast.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with satellite data used for backup purposes. No adjustments to the shaft encoder were made this water year. Gage height record is complete and reliable, except for February 26th and 27th which were missing record on part of each day.
Datum Corrections.--	Levels were not run this water year. Levels have not been run at this site since the gage was installed.
Rating.--	A 12-ft. concrete Parshall flume table (MVIDIVCO01 dated June 15, 1971) was used this water year. It is fairly well defined from 20 cfs to 475 cfs. Nine discharge measurements (Nos. 66-74) were made this year ranging in discharge from 21.9 cfs to 171 cfs. Measurements cover the range-in-stage experienced except for lower average daily flows of Oct 16-31; Dec. 31, 2008, Jan. 1-6; Mar 13-23; Apr 1-6, 9-19, 21-25, 2009; and the higher average daily flows of May 28-31; June 1-6, 30; July 14-21, 2009. The peak of May 31, 2009 at 20:00 (G.H. = 3.77 ft., Shift = 0.22, Q= 428 cfs), exceeded the stage of meas. #69, made June 11, 2009, by 1.48 feet in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by stage. Shift curve MVIDIVCOVS08 was used to begin the water year and applied through October 10, 2008 at 9:15. Shift Curve MVIDIVCOVS09 was used to complete the water year. Open-water measurements for WY09 showed shifts varying between -0.10 and -0.04 feet. Shifts were applied directly and given full weight except Measurement Nos. 67, 70, 71, and 73 which were discounted from -5% to 1% to smooth shift distribution.
Special Computations.--	Estimated hourly-data for missing record on February 26-27 was completed based on partial day record and adjacent good record.
Remarks.--	Record is good, except for partial days of February 26 and 27, which were estimated. Releases from the reservoir into the canal are fairly steady thus the missing record for this period should be considered fair.
Recommendations.--	Levels should be run in water year 2010. An electric tape or drop tape should be installed. Gage maintained by the Dolores Conservancy District and record developed by Jason Morrow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES

RATING TABLE--

MVIDIVCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	94	42	33	0	55	56	0	22	420	161	80	148
2	94	42	39	0	55	56	0	22	422	161	80	147
3	94	44	41	0	55	56	9.2	22	342	160	80	146
4	94	46	41	0	55	56	5.7	22	220	160	80	142
5	93	46	41	0	55	56	0	23	209	161	80	141
6	91	46	41	0	55	56	7.4	23	175	159	80	141
7	86	46	41	30	55	56	24	23	140	162	80	137
8	84	45	45	47	55	56	23	75	146	162	82	126
9	82	45	48	45	55	56	21	102	153	163	84	121
10	77	48	48	45	55	56	21	103	163	161	84	121
11	75	61	48	45	55	55	21	125	171	161	84	117
12	75	62	48	51	55	32	21	154	157	163	91	114
13	75	61	48	56	55	0	21	149	134	170	94	115
14	69	62	48	56	55	0	21	148	127	176	93	113
15	54	62	48	56	55	0	21	148	127	174	93	108
16	0	62	48	56	61	0	21	148	136	174	92	105
17	0	55	48	56	65	0	21	148	145	173	91	99
18	0	52	48	56	65	0	21	148	148	174	91	98
19	0	52	48	56	65	0	21	149	148	178	90	98
20	0	48	48	56	65	0	22	148	148	177	89	98
21	0	41	48	56	65	0	20	149	148	177	89	98
22	0	41	82	56	65	0	21	150	153	129	117	96
23	0	41	134	56	60	0	21	149	158	94	139	92
24	0	39	134	56	54	39	21	150	157	97	142	88
25	0	30	134	56	54	72	21	150	153	100	142	87
26	0	26	134	56	e54	57	22	150	141	99	146	87
27	0	26	134	56	e56	49	22	150	140	80	148	87
28	0	26	134	56	56	49	22	284	135	80	147	87
29	0	26	134	56	---	49	22	408	155	80	147	92
30	0	26	40	55	---	76	22	420	198	80	148	93
31	1.9	---	0	55	---	99	---	421	---	80	147	---
TOTAL	1238.90	1349	2006.00	1325.00	1610	1137.00	536.30	4483	5369	4426	3230	3342
MEAN	40	45	64.7	42.7	57.5	36.7	17.9	145	179	143	104	111
AC-FT	2460	2680	3980	2630	3190	2260	1060	8890	10650	8780	6410	6630
MAX	94	62	134	56	65	99	24	421	422	178	148	148
MIN	0	26	0	0	54	0	0	22	127	80	80	87

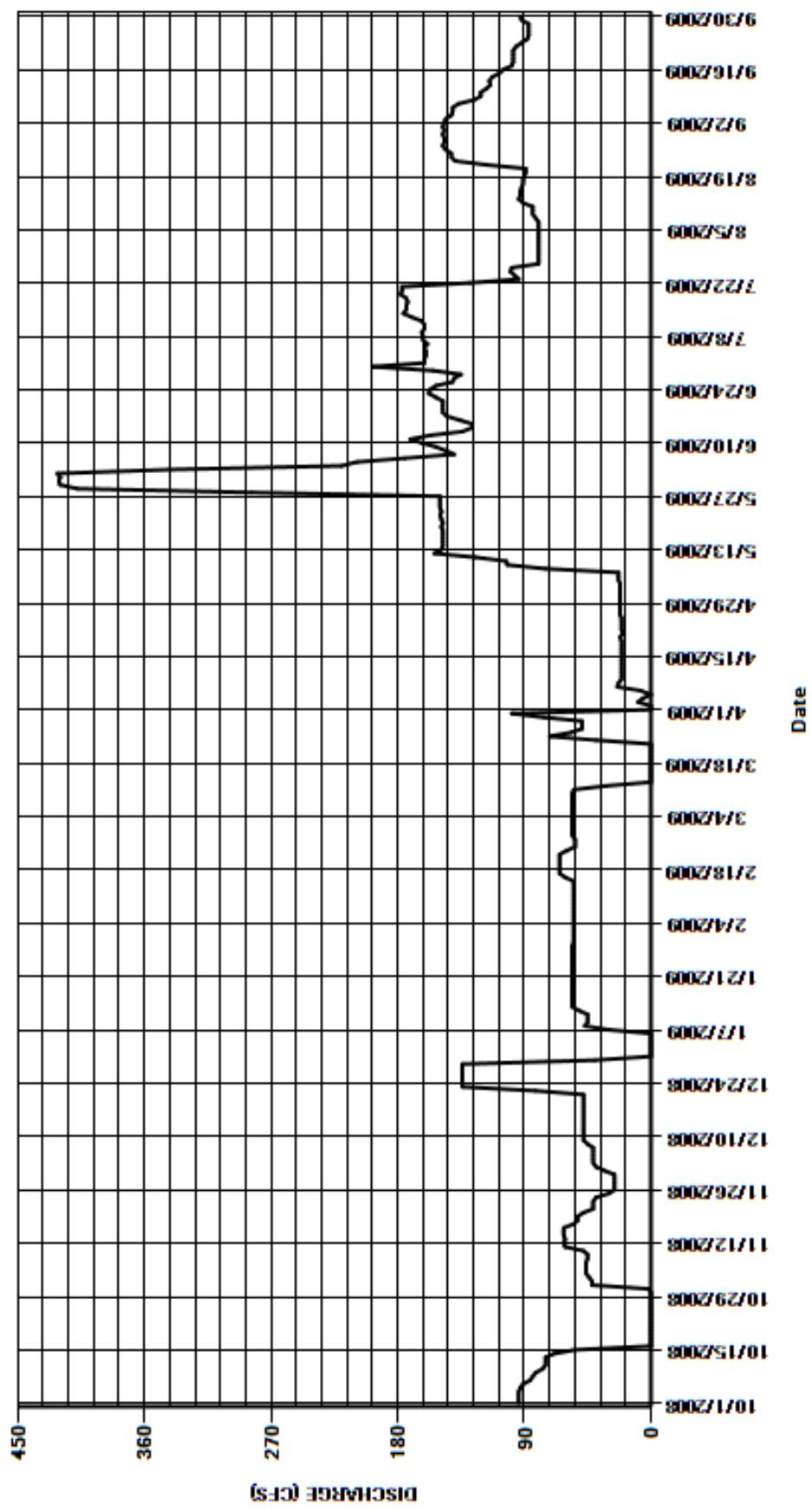
CAL YR	2008	TOTAL	28995.20	MEAN	79.2	MAX	460	MIN	0	AC-FT	57510
WTR YR	2009	TOTAL	30052.20	MEAN	82.3	MAX	422	MIN	0	AC-FT	59610

MAX DISCH: 428 CFS AT 20:00 ON May. 31,2009 GH 3.77 FT. SHIFT 0.22 FT.

MAX GH: 3.77 FT. AT 20:00 ON May. 31,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
WY2009 HYDROGRAPH



DOLORES RIVER BASIN
DOLORES RIVER BELOW MCPHEE RESERVOIR
Water Year 2009

Location.-- Lat. 37°34'33", Long. 108°34'33", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T.38 N., R.16 W., NMPM, Montezuma County.

Drainage and Period of Record.-- 819 mi².

Equipment.-- Graphic water stage-recorder and a Sutron Satlink HDR DCP with a shaft encoder on separate floats in a cast concrete block shelter and well. Primary reference is an electric drop tape inside the gage house. The gage house is equipped with AC power. Control is a 15-foot concrete Parshall flume with flat wing walls that extend the width of the channel and act as the 2nd stage control. The DCP was replaced with a Sutron Satlink 2 HDR on April 6, 2009. No other changes this water year.

Hydrographic Conditions.-- Large rocks and cobble line the channel above and below the 15-ft concrete Parshall flume. Silt deposits typically do not occur at this gage since the gage is directly below McPhee Reservoir. Heavy moss growth on the control and in the channel above the control affects the stage-discharge relationship during the summer months. Below a gage height of 3.00 the rating follows a standard 15-ft Parshall flume rating. If all the moss were removed from the flume (usually after a high flow event) shifts are generally positive due to the seepage under the wing walls. As moss grows in the flume shifts tend to be more negative.

Gage-Height Record.-- The primary record is hourly averages of 15-minute data downloaded from the DCP with chart record and satellite data used for backup purposes. The gage was visited on 13 separate occasions this water year to verify the instruments remained calibrated to the primary reference. The shaft encoder was adjusted one time this water year (July 28, 2009) with a +0.02 shaft encoder correction. Record from the DCP is complete and reliable.

Datum Corrections.-- Levels were not run this water year. Levels were last run on August 15th, 2007 using BM No. 1 as base. No corrections were made to gage heights of measurements or charts as the electric tape index elevation was found to be within allowable tolerances.

Rating.-- The control is a 15 foot Parshall Flume with flat wing walls extending 50 ft in both directions. Rating DOLBMCCO04A, dated Nov. 9, 2004, was used the entire water year. Below 3.00 ft the rating follows the general form of a standard Parshall flume. It is fairly well defined from 13 cfs to 5,580 cfs. Thirteen measurements, Nos. 187-199, were made this year ranging in discharge from 32.7 cfs to 1,320 cfs. They cover the range-in-stage experienced except for the higher average daily flows of May 13-17, 19, 20, 23-25, 2009. The peak instantaneous flow at 0430 on May 13, 2009 (2580 cfs, GH = 5.75 ft, shift= +0.09 ft) exceeded the stage of measurement No. 193, made May 19, 2009 by 1.05 feet in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time with consideration of stage from 0000 October 1, 2008 until November 13, 2008 at 1300. The control is very stable and moss growth during the winter to early summer is low, therefore a variable shift is used to describe the stage discharge relationship. Variable shift curve DOLBMCCOV09A was used from 1400 November 13, 2008 to May 25, 2009 at 2355. The receding limb of the hydrograph was described by variable shift curve DOLBMCCOVSB in use from May 26, 2009 at 0000 to July 6, 2009 at 1217. Heavy moss growth defined the shifts the remainder of the water year. Shifts were prorated by time as defined by measurements No. 195 to 199, from July 6, 2009 at 1300 until the end of the water year. Measurements show shifts varying from -0.10 ft to +0.09 ft. All shifts were given full weight except for measurement no.'s 187, 189, 190, 192, 198, and 199, which were discounted from -9% to 2% to smooth out the shift distribution.

Special Computations.-- On October 1, 2008 @ 1045 moss was removed from the concrete Parshall flume. The gage height dropped 0.11 ft after the moss was removed. The shift for water year 2008 reflect pre-moss removal conditions up to this point, after which the shift will reflect the moss removal and subsequent growth throughout the water year. After July 6, 2009 the measurements indicate a larger deviation from the rating. Moss growth is rampant at this gage from early summer to late fall. Shifts were distributed by time, between measurements in an attempt to model moss growth. In the late summer months the large cobble channel is choked with heavy moss. The velocities in the gage pool above the control are very slow as well. Heavy moss and slow velocities make for poor measurement conditions. On October 14, 2008 we began to investigate the varied results when measuring in the channel versus the Parshall flume at low flow conditions. By visual inspection the Parshall flume appears to be a better section; however we know water seeps under the weir walls of the flume. At low flow conditions (i.e. low head conditions as well) we are assuming the leakage is negligible and measuring in the flume is adequate.

Remarks.-- Record good.

Recommendations.-- Station maintained and record developed by Jason Morrow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DOLORES RIVER BELOW MCPHEE RESERVOIR

RATING TABLE--

DOLBMCCO04A USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

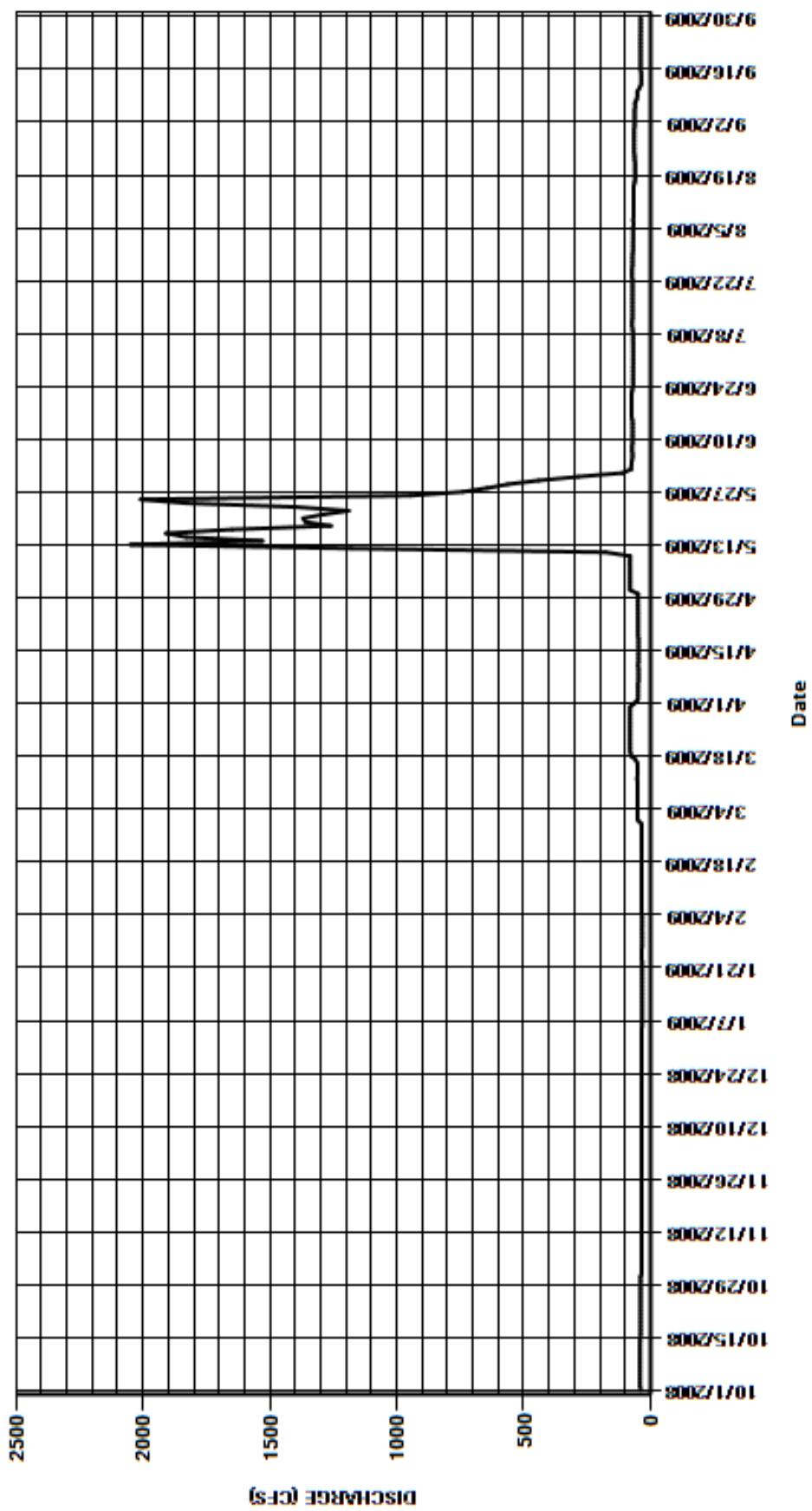
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	35	36	36	34	50	64	81	110	69	70	64
2	42	36	36	36	34	52	50	81	76	69	69	64
3	42	36	36	36	34	51	49	81	76	69	69	63
4	42	36	36	36	35	51	49	81	74	69	69	63
5	42	36	36	35	35	51	49	81	72	69	69	63
6	42	36	36	34	35	51	49	81	72	70	68	62
7	42	36	36	34	35	51	48	81	73	70	69	62
8	42	36	36	34	35	51	48	82	73	70	68	55
9	42	36	36	34	35	51	48	81	72	71	68	52
10	42	36	36	34	35	52	48	81	71	73	67	53
11	42	36	36	34	35	52	49	178	71	73	67	44
12	42	36	36	34	35	53	48	1180	71	72	67	37
13	42	36	36	34	35	52	48	2050	71	72	67	37
14	41	36	36	34	35	52	48	1530	71	72	67	37
15	41	36	36	34	35	52	48	1830	72	72	67	38
16	40	36	36	34	35	51	48	1910	75	72	67	40
17	40	36	36	34	35	59	48	1650	75	72	63	40
18	40	36	36	34	35	76	48	1260	75	72	62	40
19	40	36	36	34	35	80	49	1360	75	72	61	40
20	40	36	36	34	35	81	49	1370	75	72	62	40
21	40	36	36	34	35	81	49	1290	75	72	62	40
22	40	36	36	34	35	81	49	1190	75	72	62	40
23	40	36	36	35	35	81	49	1400	72	73	63	40
24	40	36	36	35	35	81	49	1830	69	73	64	40
25	40	36	36	35	35	81	49	2010	70	73	65	40
26	40	36	36	35	35	81	50	947	70	72	65	39
27	40	36	36	34	35	81	50	739	70	72	65	39
28	40	36	36	34	36	81	50	644	70	72	65	39
29	40	36	36	34	---	81	50	564	70	71	65	39
30	40	36	36	34	---	81	50	441	69	70	65	39
31	40	---	36	35	---	81	---	286	---	70	65	---
TOTAL	1264	1079	1116	1068	978	2010	1480	26470	2210	2210	2042	1389
MEAN	40.8	36	36	34.5	34.9	64.8	49.3	854	73.7	71.3	65.9	46.3
AC-FT	2510	2140	2210	2120	1940	3990	2940	52500	4380	4380	4050	2760
MAX	42	36	36	36	36	81	64	2050	110	73	70	64
MIN	38	35	36	34	34	50	48	81	69	69	61	37
CAL YR	2008	TOTAL	109691	MEAN	300	MAX	1970	MIN	30	AC-FT	217600	
WTR YR	2009	TOTAL	43316	MEAN	119	MAX	2050	MIN	34	AC-FT	85920	

MAX DISCH: 2580 CFS AT 04:30 ON May. 13,2009 GH 5.75 FT. SHIFT 0.09 FT.
MAX GH: 5.75 FT. AT 04:30 ON May. 13,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DOLORES RIVER BELOW MCPHEE RESERVOIR
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
BLANCO DIVERSION NEAR PAGOSA SPRINGS
Water Year 2009

Location.-- Lat. 37°12'13", Long. 106°48'35", in NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, T.34 N., R.1 E., NMPM, Archuleta County.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 HDR satellite monitoring DCP with shaft encoder. The shaft encoder and graphic recorder are on separate floats in a concrete shelter and well. The primary reference is an electric drop tape at the edge of the instrument shelf. No outside staff gage. The control is a 12-ft concrete Parshall flume set in an underground concrete box culvert. No changes this water year.

Hydrographic Conditions.-- The diversion is the beginning of the Blanco Tunnel. The Blanco Tunnel is the first leg in the trans-mountain diversion of the San Juan / Chama project. Cobble, gravel, and silt are deposited in the box culvert above the Parshall flume. The hydraulic conditions cannot be directly observed since the structure is located underground.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with chart record and DCP data used for backup purposes. The gage was visited on 9 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted once this water year. The adjustment made was -0.02-ft. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the shaft encoder. The record is complete and reliable.

Datum Corrections.-- Levels were not run in WY 2009. It is unknown when levels were last run at the gage.

Rating.-- The control is a twelve-foot Parshall flume. The Parshall flume is located underground and approximately 50 to 80 ft downstream of the radial gates. The only access point is located at the radial gates. One channel at all stages. Rating No. 1 was used the entire water year. Rating No. 1 is a standard twelve foot Parshall flume rating above a gage height of 0.06-ft. Flows below a gage height of 0.06-ft are assumed to be negligible and ignored. No discharge measurements have ever been made at the gage due to safety concerns. The peak instantaneous flow occurred at 1400 June 26, 2009 (532 cfs, GH = 4.57 ft, shift=0.00 ft).

Discharge.-- No discharge measurements are made at this gage since the control structure is located underground. The standard Parshall flume rating with a zero shift applied was used to calculate the discharge.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- The record is good. Station maintained by Brian Boughton and record developed by Brian Leavesley.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BLANCO DIVERSION NEAR PAGOSA SPRINGS

RATING TABLE--

BLADIVCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

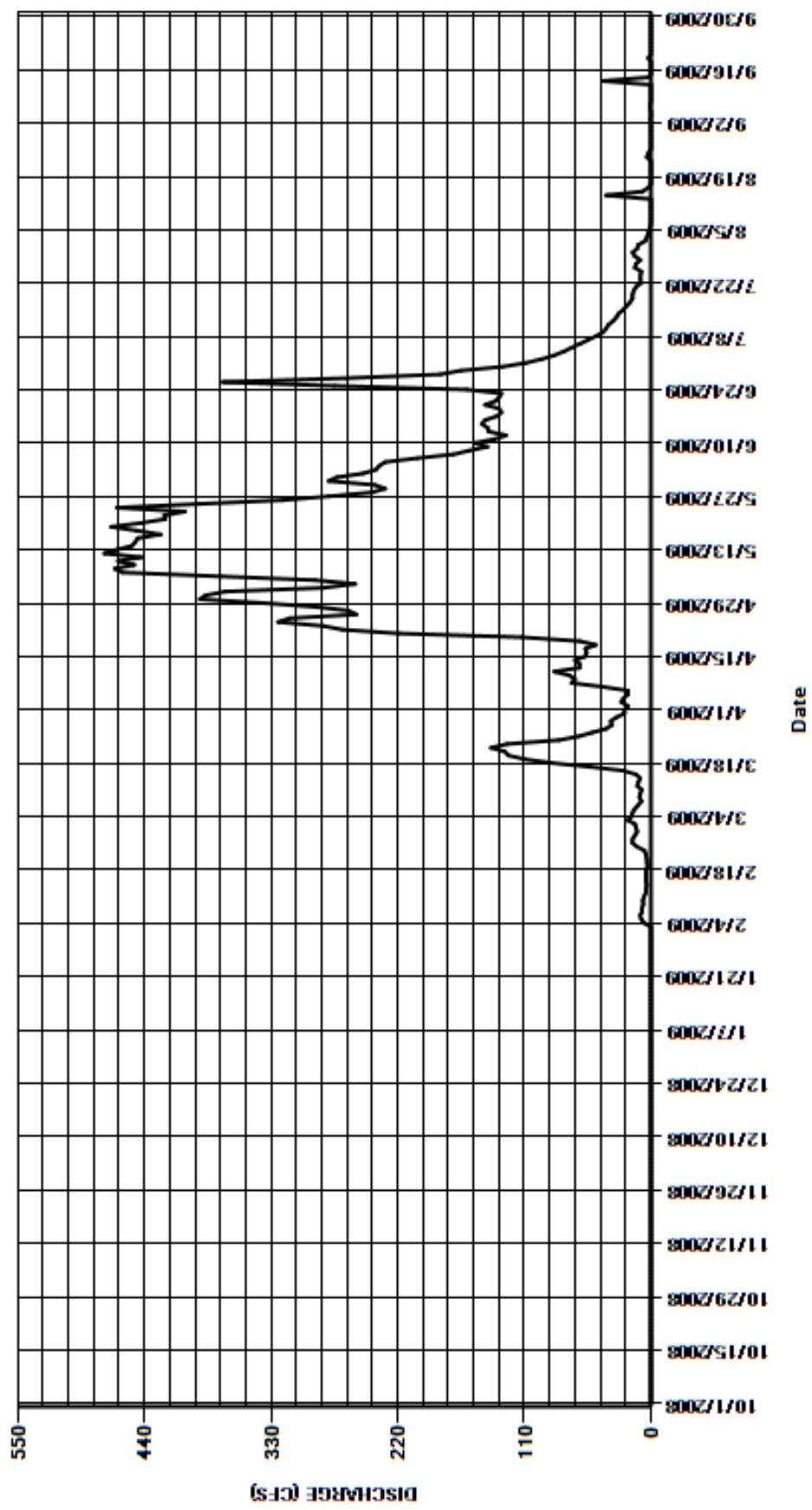
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	13	23	387	273	109	11	0
2	0	0	0	0	0	14	20	370	250	95	5.1	0.03
3	0	0	0	0	0	20	26	284	239	84	3.5	0.37
4	0	0	0	0	5.9	17	24	257	236	76	2.4	0
5	0	0	0	0	8.4	16	20	292	231	69	1.5	0.16
6	0	0	0	0	9.5	14	20	374	203	62	0.5	0.72
7	0	0	0	0	7.7	11	42	459	172	55	0	0.53
8	0	0	0	0	7.7	8.3	69	466	158	48	0	0
9	0	0	0	0	6.7	10	66	449	142	42	0	0
10	0	0	0	0	7	9.3	71	463	153	39	0	0
11	0	0	0	0	6	8.1	84	443	136	37	0	0
12	0	0	0	0	4.4	12	62	475	126	33	0	0
13	0	0	0	0	4.4	11	62	464	141	30	0	42
14	0	0	0	0	3.7	9.3	66	451	142	28	39	1.1
15	0	0	0	0	4.4	13	57	448	147	24	7.3	0
16	0	0	0	0	4.6	24	56	446	144	21	2.3	0
17	0	0	0	0	4.4	53	57	426	134	18	0	0
18	0	0	0	0	4.3	86	48	447	130	16	0	0
19	0	0	0	0	3.1	110	62	469	132	16	0	2.3
20	0	0	0	0	3.4	124	112	443	144	15	0	0.02
21	0	0	0	0	3.8	127	219	422	135	13	0	0
22	0	0	0	0	4.5	139	268	423	132	8.5	0	0
23	0	0	0	0	5.5	125	285	405	130	9.3	0	0
24	0	0	0	0	12	80	324	464	160	9.1	3.6	0
25	0	0	0	0	16	63	314	393	275	8.4	2.4	0
26	0	0	0	0	16	51	256	320	372	14	0.29	0
27	0	0	0	0	14	39	263	280	264	13	0	0
28	0	0	0	0	12	34	292	243	183	9.1	0	0
29	0	0	0	0	---	35	337	231	165	14	0	0
30	0	0	0	0	---	30	392	240	129	16	0	0
31	0	---	0	0	---	23	---	280	---	12	0	---
TOTAL	0.00	0.00	0.00	0.00	179.40	1329.0	3997	12014	5378	1043.4	78.89	47.23
MEAN	0	0	0	0	6.41	42.9	133	388	179	33.7	2.54	1.57
AC-FT	0	0	0	0	356	2640	7930	23830	10670	2070	156	94
MAX	0	0	0	0	16	139	392	475	372	109	39	42
MIN	0	0	0	0	0	8.1	20	231	126	8.4	0	0
CAL YR	2008	TOTAL	30774.50	MEAN	84.1	MAX	475	MIN	0	AC-FT	61040	
WTR YR	2009	TOTAL	24066.92	MEAN	65.9	MAX	475	MIN	0	AC-FT	47740	

MAX DISCH: 532 CFS AT 14:00 ON Jun. 26,2009 GH 4.57 FT. SHIFT 0 FT.

MAX GH: 4.57 FT. AT 14:00 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BLANCO DIVERSION NEAR PAGOSA SPRINGS
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
Water Year 2009

Location.-- Lat. $37^{\circ}12'13''$, Long. $106^{\circ}48'42''$, in NW $\frac{1}{4}$ sec. II, T.34 N., R.I E., NMPM, Archuleta County, Hydrologic Unit 14080101, on left bank 250 ft downstream from Blanco Diversion Dam, 1.1 mi downstream from Leche Creek, and 12 mi southeast of Pagosa Springs.

Drainage and Period of Record.-- 69.1 mi². March 1971 to current year.

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 HDR satellite monitoring DCP with shaft encoder. The shaft encoder and graphic recorder are on separate floats in a 48-inch by 48-inch concrete shelter and well. The primary reference is an electric drop tape at the edge of the instrument shelf. No outside staff gage. The control is a 4-ft steel Parshall flume set in a concrete structure that acts as a weir at high flows. No changes this water year.

Hydrographic Conditions.-- Cobble, gravel, and silt are deposited in the stilling pool above the control. Once a year, or at least every other year, the USBR removes the deposits above the control section. Approximately 250 feet above the control is a USBR diversion dam for the SanJuan/Chama Project.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with chart record and DCP data used for backup purposes. The gage was visited on 12 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 3 separate occasions this water year. All adjustments made were ± 0.01 feet. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the shaft encoder. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Dec. 15, Dec. 20, 2008 – Feb. 5, 2009

Datum Corrections.-- Levels were not run in WY 2009. Levels were last run on October 20, 2005 to the inside gage (ET index) using RM#1 as the base. No corrections were made as the electric tape index and electric tape length were found to be within allowable tolerances.

Rating.-- The control is a four-foot Parshall flume installed in December 1979 to replace a v-notch weir. At an elevation of 3.00 feet, horizontal concrete wing walls extend in both directions for a total of 76 feet, and form the control. One channel at all stages. Rating No. 6, dated Feb. 1, 2001, continued to be used this year. Rating No. 6 is based on the general shape of a four foot Parshall flume theoretical rating, and is the same as Rating No. 5, dated Dec. 26, 1985, above 3.00 feet. It is fairly well defined from 4.0 to 211 cfs. Eleven measurements (Nos. 780 – 790) were made during this water year ranging in discharge from 14.0 to 42.2 cfs. They cover the range in stage experienced except for the lower average daily flow of Feb. 19; Aug. 12-13, 21-24, 31; Sep. 1-2, 2009, and the higher average daily flows of Oct. 5-6, 12, 2008; May 1-25; Jun. 26; Sep. 13, 20, 2009. The peak instantaneous flow at 2100 May 10, 2009 (418 cfs, GH = 3.84 ft, shift=0.00 ft) exceeded the stage of measurement No. 784, made May 1, 2009 by 2.00 feet in stage.

Discharge.-- Shifting section control method was used for all periods of good record. Shifting is mainly caused by erosion and deposition of small to medium gravels in the approach section of the flume and by the accumulation of trash and debris on the wing walls at flows above gage height of 2.70 ft. The approach sections and the wing walls are periodically cleaned by the USBR or State of Colorado employees and are noted on the chart. Shifts were applied as defined by measurements and were distributed by time for the entire period of record. A 0.00 ft. shift was used from 0000 Oct. 01, 2008 through 0845 June 2, 2009 at which time the USBR began to remove silts from in front of the flume. Shifts were distributed by time from 0900 June 2, 2009 until 1300 June 2, 2009 (0.00 ft to +0.03 ft. shift) during the few hours when the silt was removed. A +0.03 ft. shift was applied for the period of 1400 June 02, 2009 to the end of the water year. The weir pool was cleaned again on June 30, 2009 but this did not appear to have an impact on shifts. It was assumed the weir pool required cleaning again after the June 25th and 26th storm events. Discharge measurements showed raw shifts ranging between -0.02 ft. and +0.04. Measurement Nos. 780-788 were discounted between -3% and +5% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records from the Navajo River at Banded Peaks ranch gaging station and partial days of good record. Estimation was performed by looking at the base flow between affected periods and adjusting baseflow by observed trends in discharge-temperature relationship on good record days adjacent to the estimated period. Graphical data was a secondary source for estimation.

Remarks.-- The record is good, except for the period of ice-affected days in which the record should be considered poor. The instantaneous peak flow of May 10, 2009 should be considered poor as it exceeds the highest historical measured discharge made in water year 2001 by 150%. Daily flows on May 7-15, 17-19, 2009 should also be considered fair as they exceeded the highest measured discharge this water year by 150%. Station maintained by Brian Boughton and record developed by Brian Leavesley.

Recommendations.-- A crest gage should be installed at the gage to maintain a peak gage height record. Levels should be run at the gage in water year 2010. GPS should be taken to the site to obtain refined LAT/LONG coordinates as there is discrepancy in the seconds of longitude between the station description and AQUAMAP GIS (orig. was ...38" long., GIS shows ...44" long.).

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA

RATING TABLE--

RIOBLACO06 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

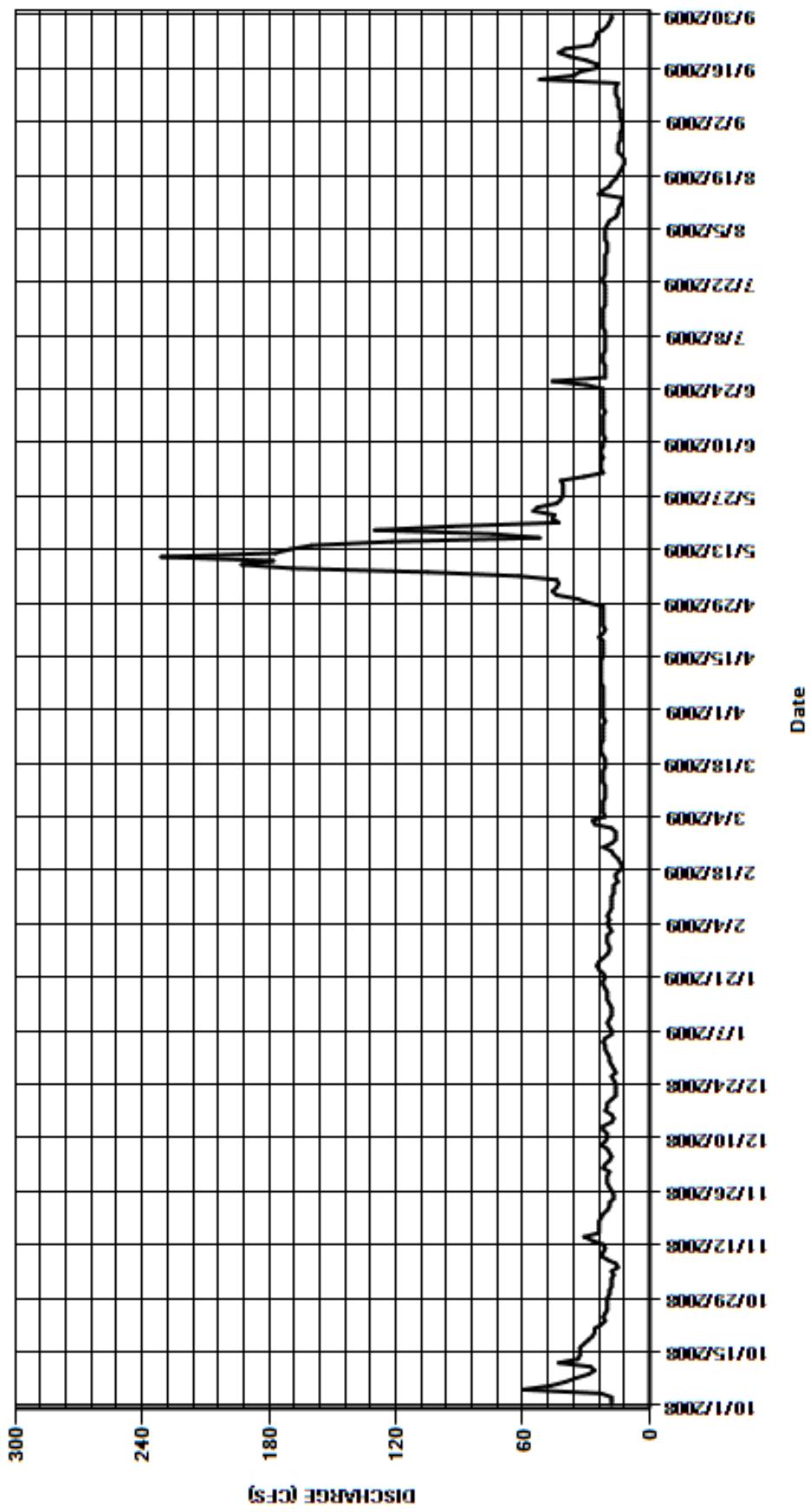
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	18	19	e20	e20	18	22	44	31	22	20	13
2	18	18	22	e21	e18	26	22	46	22	22	21	13
3	18	18	21	e21	e19	27	22	44	23	22	21	14
4	23	17	19	e22	e20	21	22	43	23	21	21	14
5	60	18	18	e21	e19	22	22	44	23	21	21	14
6	47	15	19	e18	20	22	22	62	22	21	20	15
7	40	16	20	e18	19	22	22	105	23	21	19	15
8	35	20	23	e19	18	22	23	169	23	21	16	15
9	29	23	21	e20	18	21	23	193	22	21	15	16
10	26	22	20	e19	18	21	23	178	22	22	15	16
11	28	21	20	e18	18	21	23	231	21	22	14	16
12	43	22	22	e18	17	21	23	177	22	22	13	15
13	34	27	22	e18	17	22	23	170	22	22	13	52
14	33	31	18	e19	17	22	23	160	22	22	24	36
15	33	24	e17	e20	15	22	22	122	22	22	22	33
16	33	24	18	e20	16	22	22	52	22	21	19	25
17	31	24	21	e20	16	21	22	74	22	21	18	25
18	29	24	20	e21	14	21	22	130	21	21	16	30
19	27	23	20	e22	13	21	22	94	22	21	15	38
20	26	22	e18	e22	14	22	24	43	22	21	14	43
21	26	20	e16	e21	15	23	22	46	22	21	13	40
22	23	19	e16	e22	17	23	21	45	22	22	12	27
23	21	19	e16	e24	18	23	22	55	22	22	12	26
24	22	17	e16	e25	22	22	22	53	22	21	13	25
25	21	17	e17	e24	18	22	22	44	30	21	15	25
26	20	18	e18	e22	16	22	22	42	46	21	15	22
27	20	19	e16	e20	16	22	22	41	21	21	15	20
28	20	20	e17	e19	16	22	22	41	21	21	14	19
29	20	20	e18	e19	---	21	29	41	21	21	14	18
30	19	20	e19	e20	---	22	34	41	21	20	14	18
31	19	---	e19	e20	---	22	---	42	---	20	13	---
TOTAL	862	616	586	633	484	681	687	2672	700	660	507	698
MEAN	27.8	20.5	18.9	20.4	17.3	22	22.9	86.2	23.3	21.3	16.4	23.3
AC-FT	1710	1220	1160	1260	960	1350	1360	5300	1390	1310	1010	1380
MAX	60	31	23	25	22	27	34	231	46	22	24	52
MIN	18	15	16	18	13	18	21	41	21	20	12	13
CAL YR	2008	TOTAL	9683	MEAN	26.5	MAX	231	MIN	15	AC-FT	19210	
WTR YR	2009	TOTAL	9786	MEAN	26.8	MAX	231	MIN	12	AC-FT	19410	

MAX DISCH: 418 CFS AT 21:00 ON May. 10,2009 GH 3.84 FT. SHIFT 0 FT.

MAX GH: 3.84 FT. AT 21:00 ON May. 10,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
RIO BLANCO AT THE MOUTH NEAR TRUJILLO
Water Year 2009

Location.-- Lat. 37°07'40", Long. 107°02'03", in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T.33 N., R.2 W., NMPM, Archuleta County.

Drainage and Period of Record.-- 170 mi².

Equipment.-- Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 48-inch corrugated well and a 96-inch by 60-inch wooden shelter. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP) on the instrument shelf. The low flow control is a cobble riffle 15-ft below the gage. At medium and high flows a boulder weir located 30-ft. below the gage controls. No other changes.

Hydrographic Conditions.-- Large cobbles and boulders line the channel above and below the gage. A large boulder weir was installed below the gage. The United States Bureau of Reclamation diverts a majority of the water upstream of the gage for the San Juan Chama Project. The gage is located approximately one mile above the confluence with the San Juan River.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 18 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 4 separate occasions. All adjustments made were -0.02 to -0.01 feet. The record was corrected by prorated by time to the last known matched reading. Five flush corrections were made this water year. The flush corrections occurred on Nov. 19, 2008 (-0.05 ft), May 18, 2009 (-0.07 ft), Jun. 15, 2009 (-0.04 ft), Jul 30, 2009 (-0.02 ft) and Aug. 7, 2009 (-0.05 ft). The flush corrections at this gage tend to be negative because groundwater infiltrates the stilling well. The flush corrections were prorated by time within the final record depending on the location of the inflection point on the hydrograph. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Dec. 20-31, 2008; Jan. 1-31; Feb. 1-28; Mar. 1-7, 2009; and a datum correction could not be resolved when the shaft encoder reset during an electrical storm: Sep. 6-9, 2009.

Datum Corrections.-- All the existing benchmarks were destroyed during the river restoration project in Sept. 2007. Levels were not run this water year. A poor set of levels were ran on July 8, 2008 to move the RP from the old gage house to the new gage house. The RP elevation was placed at the same elevation of the abandoned gage house (RP = 10.83 ft.).

Rating.-- The control is a boulder weir located approximately 30-ft. below the gage. Small gravels fill and scour with the change in stage causing shifts. Rating No. 3, dated May 3, 1990, was continued until November 19, 2008. Rating No. 4 was used from November 19, 2008 until the end of the water year. Nine measurements (Nos. 610-618) were made during the current water year ranging in discharge from 20.2 to 266 cfs. They cover the range in stage experienced, except for the lower average daily flows of Oct. 1-4, Nov. 6, 7, Dec. 27-31, 2008, Jan. 1, 3-19, 21, 27-31; Feb. 1-6, 9-22; Jul. 9-25, 28, 29, 31; Aug. 1-14, 16-30; Sep. 1-11, 25-30, 2009 and the higher average daily flows of May 8-14, 2009. The instantaneous peak flow of 551 cfs, which occurred at 0130, May 11, 2009, at a gage height of 3.58 ft and a shift of +0.05 exceeded measurement No. 614 made May 12, 2009 by 0.84 ft in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifts were distributed by time with consideration given to change in stage. Shifting is mainly caused by erosion and deposition of small to medium gravels on the control section. Shifts were prorated by time from 0000 Oct. 1, 2008 until 0800 Mar. 18, 2009. Shifts were distributed by stage using variable shift curve RIOMOUVS09A from 0900 Mar. 18, 2009 until the end of the water year. Measurements show shifts varying from -0.04 to +0.05 feet. Shifts were applied directly and given full weight except for measurement No's. 610, 611, 612, 615 and 617 which were discounted -7% to 8% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice affected record was estimated on the basis of adjacent good record days, partial good record days, comparison with the Rio Blanco below the Blanco Diversion Dam (RIOBLACO) gage and air temperature records at the Navajo River at Banded Peaks gage. A hydrograph was used. Five electrical storms occurred during the period in May, August and September that caused the shaft encoder to reset to 0. A datum correction was applied to the bad data and reloaded into the record program. The correction was resolved by applying a datum correction and comparing it with good data before and after the reset occurred. The shaft encoder data for the period Sep. 6-9, 2009 remained unresolved because of multiple resets within incorrect gage height readings. Chart record was used to complete the record during the September time period.

Remarks.-- Record fair, except for those periods of ice affect which should be considered poor. Station operated and maintained and record developed by Brian Boughton.

Recommendations.-- Levels need to be run and new benchmarks established.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RIO BLANCO AT THE MOUTH NEAR TRUJILLO

RATING TABLE--

RIOMOUCO03 USED FROM 01-Oct-2008 TO 19-Nov-2008
RIOMOUCO04 USED FROM 19-Nov-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

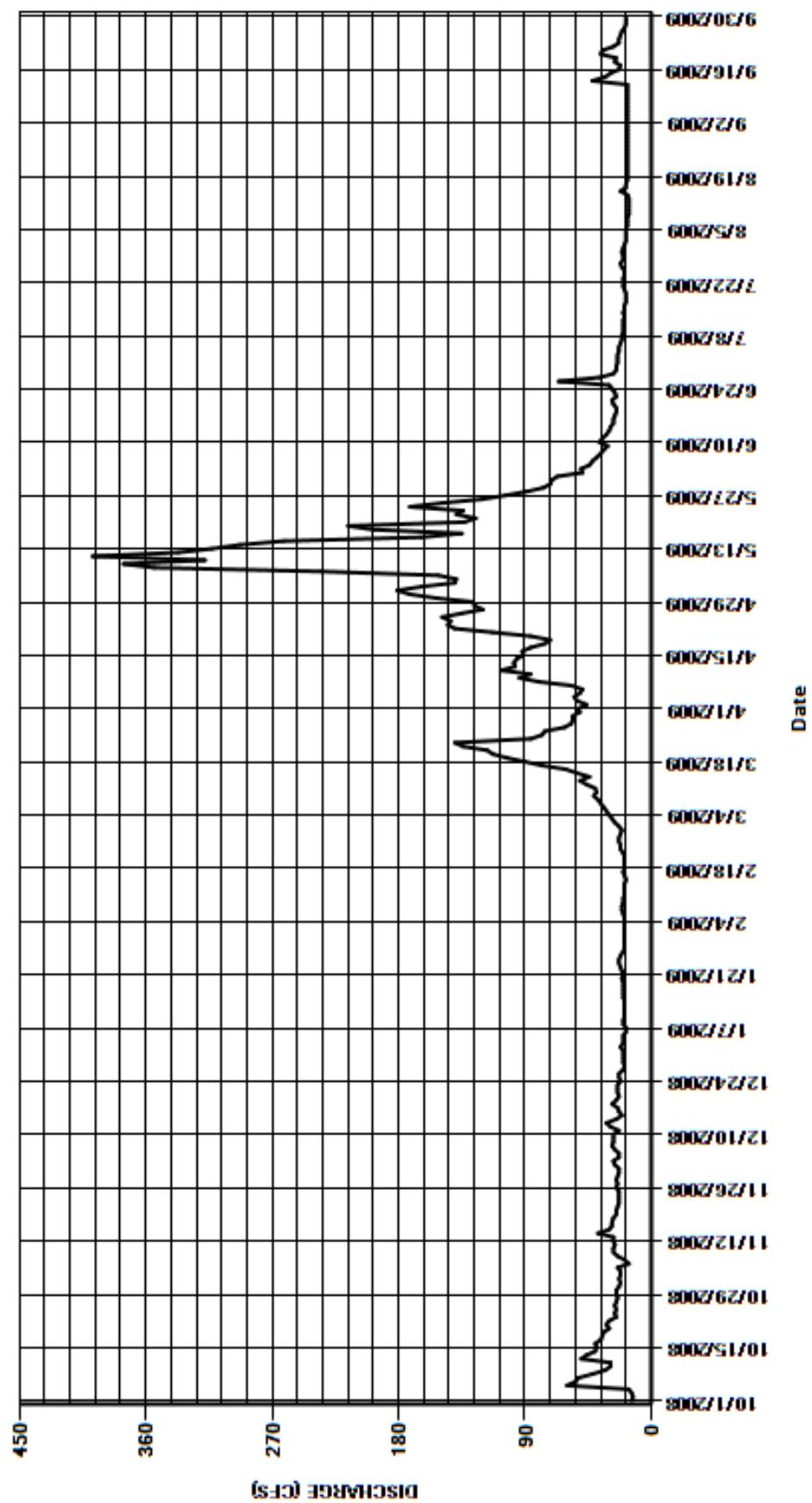
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	22	23	e20	e19	e23	52	172	67	24	19	17
2	13	23	26	e22	e19	e26	46	181	49	24	18	17
3	14	22	27	e20	e19	e28	53	164	50	24	18	17
4	16	22	23	e20	e19	e30	55	140	44	23	18	17
5	60	24	23	e20	e19	e32	51	139	42	23	18	17
6	54	16	26	e18	e20	e34	49	152	39	22	17	17
7	52	19	28	e18	e21	e36	57	235	36	21	17	17
8	42	24	27	e20	e21	38	80	354	34	21	17	17
9	33	27	27	e20	e20	41	94	376	31	20	16	17
10	29	27	27	e19	e20	39	86	318	37	20	16	17
11	29	26	23	e19	e19	40	107	398	35	20	16	17
12	50	27	29	e19	e19	46	97	337	32	20	16	17
13	46	27	32	e19	e19	51	98	313	30	19	16	42
14	40	38	25	e19	e19	44	96	293	29	20	17	33
15	39	30	21	e20	e18	53	91	262	27	19	22	29
16	40	28	23	e20	e19	61	92	164	27	19	18	23
17	36	28	24	e20	e20	78	86	135	26	18	18	22
18	35	27	28	e20	e19	90	76	198	25	18	17	26
19	34	25	25	e20	e19	103	72	216	25	18	17	25
20	30	25	e23	e21	e19	113	86	133	27	19	17	36
21	32	24	e24	e20	e19	117	113	125	28	20	17	35
22	30	23	e24	e21	e20	134	140	139	25	20	17	27
23	25	23	e24	e22	e22	140	145	134	26	20	17	23
24	26	23	e22	e23	e22	86	143	172	28	19	17	23
25	25	23	e23	e23	e23	78	149	149	30	19	17	22
26	26	25	e23	e22	e23	76	135	121	66	21	17	21
27	25	24	e20	e20	e22	62	120	104	37	22	17	19
28	24	25	e19	e19	e21	57	126	89	27	20	17	18
29	25	24	e20	e19	---	56	127	77	25	20	17	18
30	25	23	e20	e19	---	56	153	72	25	21	17	18
31	23	---	e20	e19	---	51	---	71	---	20	17	---
TOTAL	992	744	749	621	559	1919	2875	5933	1029	634	535	664
MEAN	32	24.8	24.2	20	20	61.9	95.8	191	34.3	20.5	17.3	22.1
AC-FT	1970	1480	1490	1230	1110	3810	5700	11770	2040	1260	1060	1320
MAX	60	38	32	23	23	140	153	398	67	24	22	42
MIN	13	16	19	18	18	23	46	71	25	18	16	17

CAL YR	2008	TOTAL	24390	MEAN	66.6	MAX	681	MIN	13	AC-FT	48380
WTR YR	2009	TOTAL	17254	MEAN	47.3	MAX	398	MIN	13	AC-FT	34220

MAX DISCH: 551 CFS AT 01:30 ON May. 11,2009 GH 3.58 FT. SHIFT 0.05 FT.
MAX GH: 3.58 FT. AT 01:30 ON May. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RIO BLANCO AT THE MOUTH NEAR TRUJILLO
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO
Water Year 2009

Location.--	Lat. 37°05'07", Long. 106°41'20", in SE 1/4 NW 1/4 sec. 24, T.33 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on right bank at downstream side of private bridge on Banded Peak Ranch, 0.5 mi downstream from Cutthroat Creek, 2.8 mi downstream from East Fork of the Navajo River, and 11.2 mi northeast of Chromo, Co.
Drainage and Period of Record.--	69.8 mi ² .
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP in a 48-inch x 48-inch redwood shelter and well. The shaft encoder and graphic recorder are on separate floats. The floats are located inside a 14-inch PVC oil cylinder. The primary reference gage is an electric drop tape in the gage. A drop tape is a supplemental reference gage and is mainly used when the well is frozen. An air temperature sensor and Sutron AccuBubbler are used for supplemental purposes. A bank operated cableway located approximately 40 feet below the gage is used for high flow measurement. No other changes.
Hydrographic Conditions.--	The stream channel above and below the natural channel control is composed of sand, gravel, and cobble. In the Spring, sustained high water scours sand and gravel from the streambed. In mid-Summer to late Fall and Winter, the sand and gravel are deposited in the channel at the gage. The control and channel are highly susceptible to fill and scour events.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 14 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. Record is complete. It is reliable, except for the following periods, when the stage-discharge relationship was affected by ice: Nov. 6-7; Dec. 4-5, 10-12, 14-31, 2008; Jan. 1-2, 7-8, 10-21, 27-31; Feb. 1-5, 7, 12, 15-16, 19-22, 2009. Over the water year, 6 flush corrections were made to the GH record. They occurred as a result of flushing the intakes on: 5/1, 6/1, 7/7, 7/23, and 8/18/09. The flush correction on 8/18 had to be distributed manually as there was a concurrent shaft encoder correction within the record. The bubbler equipment was used as a secondary reference and was deemed to be unreliable this water year as the line in the river became free to move up and down in the flow, it was secured in place mid-way through the summer to a t-post.
Datum Corrections.--	Levels were run on July 23, 2009 using BM #6 as a base. The electric tape index (ET index) was found to be +0.005 feet high. The RP was found to be -0.002 feet low. No corrections were made to gage heights of measurements or charts as the elevations are within the allowable error tolerances.
Rating.--	The control consists of a cobble riffle that varies during the course of the year from 30 to 70 feet below the gage. Shifting occurs throughout the range-in-stage. Rating No. 23, dated Aug. 22, 1996, was continued in use this year. It is fairly well defined between 22 and 603 cfs. Fourteen measurements (Nos. 822 – 835) were made during the current water year ranging in discharge from 28.3 to 525 cfs. They cover the range in stage except for the higher daily flows of May 8-25, 2009, when the average daily discharge was above 525 cfs, and the lower range in stage except for lower average daily flows of Dec. 14-15, 2008. The peak discharge of 958 cfs, which occurred on May 14, 2009 at 2300 at a gage height of 3.58 feet and a shift of +0.23 feet, exceeded measurement No. 827 (5/12/2009@1152) by 0.47 feet in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition on the control section below the gage. Shifts were distributed by time with consideration given to change in stage. Measurements showed unadjusted shifts from -0.12 to +0.25 ft. All were given full weight and applied directly except for measurement Nos. 826, 832, & 835 which were discounted between -8 and -4 % in order to smooth the shift distribution. The calculated shift for measurement No. 824 of -0.06 feet was not used due to ice conditions; the previous shift of -0.01, from measurement no. 823 was used during ice affected record.
Special Computations.--	Discharge for periods of ice effect was estimated on the basis of good record before and after ice affect, partial day of good records and the temperature record from the air temperature sensor at the gaging station. There was a concurrent shaft encoder and flush correction that took place between 7/23 and 8/18. A +0.01 ft SE correction was distributed by time from 7/23 to 8/18, and a +0.01 flush correction distributed by time starting on 8/14 through 8/18. The calculation was made using the DWR unit time prorated shift program and the two adjustments added together.
Remarks.--	Record is good, except for the days on which ice affected the stage-discharge relationship, and Apr 24-May 12, when sand and gravel plugged the inlet and major flush corrections took place, all of which should be considered poor. The period after the flush correction from 5/12 to 6/1 should also be considered poor since there appears to be drawdown in the well after the middle intake was flushed. The instantaneous peak flow should be considered as poor as it exceeded the highest measured discharge by more than 150%. Gage operated and maintained by Div 7 staff and record developed by Brian Leavesley.
Recommendations.--	The shelter needs a new coat of stained to prevent deterioration. Also, the bubbler gage line should be secured in the river and the gage calibrated.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO

RATING TABLE--

NAVBANCO23 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

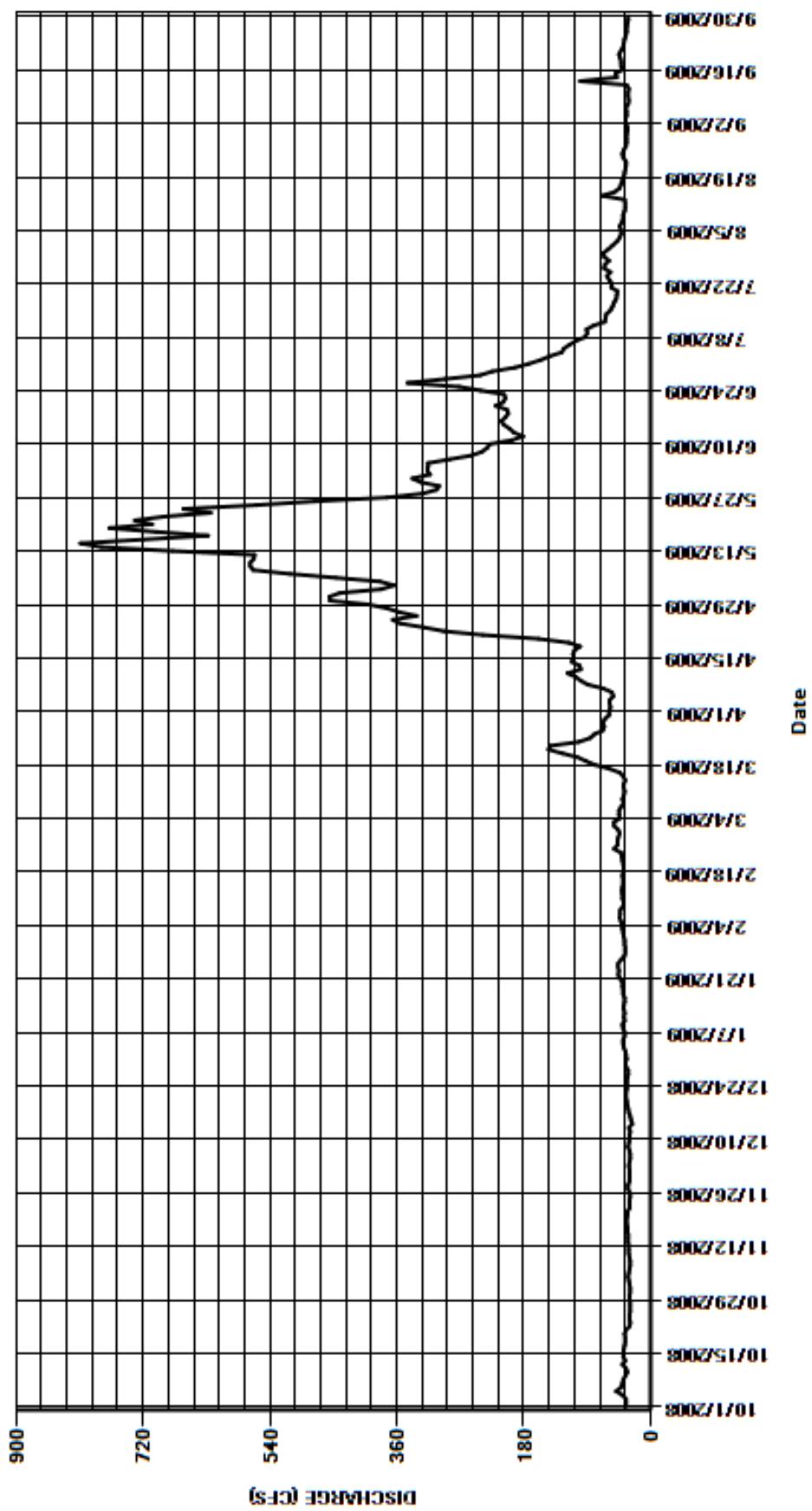
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	29	30	e35	e38	46	59	456	338	173	54	33
2	35	30	30	e36	e39	52	57	441	313	156	48	35
3	35	31	31	38	e40	52	58	382	317	143	44	36
4	40	32	e30	39	e41	44	58	364	316	126	42	34
5	49	31	e29	39	e42	45	53	384	316	123	42	34
6	42	e30	29	37	44	45	55	447	285	115	44	35
7	40	e29	30	e37	e43	42	67	512	254	106	41	32
8	39	29	32	e39	43	38	89	564	239	93	39	31
9	36	30	31	40	39	40	99	568	232	90	39	32
10	33	31	e30	e37	38	38	106	568	228	91	37	32
11	35	31	e30	e38	40	37	118	563	197	81	36	31
12	40	31	e29	e37	e40	38	99	562	181	65	36	34
13	36	32	31	e38	41	38	101	678	194	64	37	100
14	39	32	e26	e38	40	36	112	779	200	63	69	48
15	38	32	e28	e37	e39	39	109	809	208	57	51	50
16	38	33	e29	e37	e39	44	110	720	212	54	44	40
17	37	33	e31	e39	40	59	108	628	206	52	42	42
18	36	34	e32	e39	39	79	100	702	202	49	40	42
19	36	34	e33	e40	e38	92	116	768	204	48	38	43
20	37	33	e34	e40	e39	104	159	707	220	47	37	45
21	35	33	e35	e43	e40	125	238	732	209	56	36	42
22	30	30	e35	46	e41	145	293	690	206	55	35	39
23	29	30	e34	45	42	142	322	624	208	59	35	38
24	30	30	e33	46	52	102	355	663	241	62	39	37
25	30	29	e34	46	47	86	366	560	272	57	40	35
26	29	30	e33	42	47	80	332	477	345	66	38	34
27	29	32	e32	e37	46	68	357	374	292	65	35	34
28	29	32	e32	e36	44	66	374	324	242	59	34	33
29	30	30	e35	e36	---	68	401	304	225	66	34	32
30	30	30	e36	e37	---	65	455	300	193	67	34	32
31	29	---	e34	e37	---	59	---	326	---	60	33	---
TOTAL	1086	933	978	1211	1161	2014	5326	16976	7295	2468	1253	1165
MEAN	35	31.1	31.5	39.1	41.5	65	178	548	243	79.6	40.4	38.8
AC-FT	2150	1850	1940	2400	2300	3990	10560	33670	14470	4900	2490	2310
MAX	49	34	36	46	52	145	455	809	345	173	69	100
MIN	29	29	26	35	38	36	53	300	181	47	33	31
CAL YR	2008	TOTAL	45986	MEAN	126	MAX	653	MIN	26	AC-FT	91210	
WTR YR	2009	TOTAL	41866	MEAN	115	MAX	809	MIN	26	AC-FT	83040	

MAX DISCH: 958 CFS AT 23:00 ON May. 14,2009 GH 3.58 FT. SHIFT 0.23 FT.

MAX GH: 3.58 FT. AT 23:00 ON May. 14,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
OSO DIVERSION NEAR CHROMO, CO.

Water Year 2009

Location.-- Lat. 37°01'49", Long. 106°44'14", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, T.32 N., R.2 E., NMPPM, Archuleta County.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 HDR satellite monitoring DCP with shaft encoder. The shaft encoder and graphic recorder are on separate floats in a concrete shelter and well. The control is a 15-ft concrete Parshall flume. No changes this water year.

Hydrographic Conditions.-- The diversion is one leg in the trans-mountain diversion of the San Juan / Chama project. Cobble, gravel, and silt are deposited in the box culvert above the Parshall flume. The hydraulic conditions cannot be directly observed since the structure is located underground.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with chart record and DCP data used for backup purposes. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the shaft encoder. The record is complete and reliable.

Datum Corrections.-- Levels were not run in WY 2009. It is unknown when levels were last run at the gage.

Rating.-- The control is a 15 ft concrete Parshall Flume. A standard 15-foot Parshall Flume rating table was used. The peak instantaneous flow occurred at 0615 May 15, 2009 (546 cfs, GH= 4.07 ft, shift=0.00 ft).

Discharge.-- No discharge measurements are made at this gage since the control structure is located underground. The standard Parshall flume rating with a zero shift applied was used to calculate the discharge. No discharge measurements have ever been made at the gage due to safety concerns.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- The record is good. Station maintained by the USBR and record developed by Brian Boughton.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

OSO DIVERSION NEAR CHROMO, CO.

RATING TABLE--

OSODIVCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

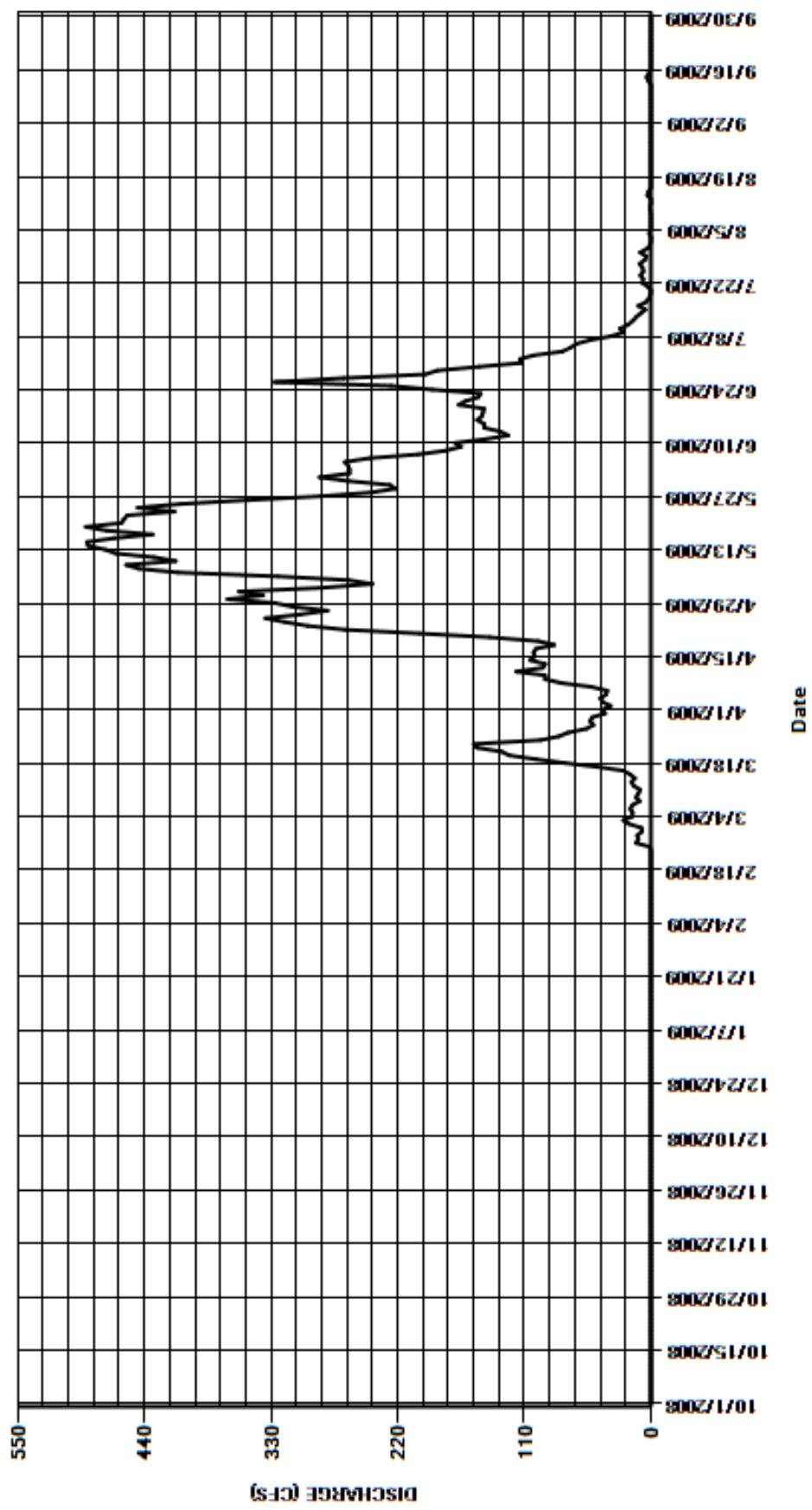
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	8.3	42	337	288	113	0.73	0
2	0	0	0	0	0	19	35	358	262	114	0	0
3	0	0	0	0	0	24	42	286	262	102	0	0
4	0	0	0	0	0	16	44	242	263	77	1.6	0
5	0	0	0	0	0	16	39	263	266	70	0	0
6	0	0	0	0	0	18	38	324	245	65	0	0
7	0	0	0	0	0	16	52	411	202	53	0	0
8	0	0	0	0	0	9.8	78	445	178	35	0	0
9	0	0	0	0	0	13	92	456	165	24	0	0
10	0	0	0	0	0	11	92	413	170	27	0.51	0
11	0	0	0	0	0	9.3	117	432	144	20	0.8	0
12	0	0	0	0	0	15	94	465	124	16	0	0
13	0	0	0	0	0	17	92	474	131	13	0	2.2
14	0	0	0	0	0	14	105	489	145	9	3.1	3.8
15	0	0	0	0	0	18	101	490	145	4.9	2.1	1.8
16	0	0	0	0	0	24	102	467	151	11	0	0
17	0	0	0	0	0	47	100	433	147	4.2	0	0.04
18	0	0	0	0	0	75	84	473	146	1.6	0	0
19	0	0	0	0	0	100	98	491	145	0.49	0	0
20	0	0	0	0	0	123	140	460	167	0	0	0
21	0	0	0	0	0	130	201	458	161	2.6	0	0
22	0	0	0	0	0	151	266	455	150	7.5	0	0
23	0	0	0	0	0	154	298	414	148	6.7	0	0
24	0	0	0	0	0.78	96	318	446	190	9.2	0	0
25	0	0	0	0	13	80	335	408	226	6.7	0	0
26	0	0	0	0	11	72	305	351	327	7.3	0	0
27	0	0	0	0	12	56	281	288	267	10	0	0
28	0	0	0	0	7.9	50	311	243	196	5.4	0	0
29	0	0	0	0	---	53	327	222	186	4	0	0
30	0	0	0	0	---	51	368	227	149	9.4	0	0
31	0	---	0	0	---	40	---	263	---	3.2	0	---
TOTAL	0.00	0.00	0.00	0.00	44.68	1526.4	4597	11984	5746	832.19	8.84	7.84
MEAN	0	0	0	0	1.6	49.2	153	387	192	26.8	0.29	0.26
AC-FT	0	0	0	0	89	3030	9120	23770	11400	1650	18	16
MAX	0	0	0	0	13	154	368	491	327	114	3.1	3.8
MIN	0	0	0	0	0	8.3	35	222	124	0	0	0
CAL YR	2008	TOTAL	34092.24	MEAN	93.1	MAX	529	MIN	0	AC-FT	67620	
WTR YR	2009	TOTAL	24746.95	MEAN	67.8	MAX	491	MIN	0	AC-FT	49090	

MAX DISCH: 546 CFS AT 06:15 ON May. 15,2009 GH 4.07 FT. SHIFT 0 FT.

MAX GH: 4.07 FT. AT 06:15 ON May. 15,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

OSO DIVERSION NEAR CHROMO.CO.
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
Water Year 2009

Location.-- Lat. $37^{\circ}01'49''$, Long. $106^{\circ}44'14''$, in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 9, T.32 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on left bank 600 ft downstream from Oso Diversion Dam, 5.8 mi east of Chromo, and 6.1 mi upstream from Little Navajo River.

Drainage and Period of Record.-- 100.5 mi 2 . March 1971 to current year.

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 DCP and shaft encoder on a separate float in a concrete shelter and well. The primary reference gage is an electric drop tape in the gage. No outside staff gage. Control is an 8-foot Parshall flume set in a 60-foot wide concrete structure that acts as a weir at higher flows. No changes this water year.

Hydrographic Conditions.-- Cobble and gravel are deposited in the stilling pool above the control. At least once year the USBR removes sediment deposited above the control section. Approximately 250 feet above the control is a USBR diversion dam for the San Juan/Chama Project. The San Juan/Chama Project is a trans-basin diversion that diverts water through a pipeline and is delivered to the Rio Grande River basin in New Mexico.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with chart record and DCP data used for backup purposes. The gage was visited on 18 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. No shaft encoder adjustments were made this water year. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the shaft encoder. One flush correction was made this water year. The flush correction occurred on May 1, 2009 (+0.05 ft). The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Dec. 14-31, 2008; Jan. 1-22, 29-31; Feb. 1, 2, 2009.

Datum Corrections.-- Levels were run on July 23, 2009 to the electric tape index using RM#1 as the base. The ET index was found to be reading +0.007 feet high. No corrections were made since the ET index was within the allowable error tolerances. Levels were also run to the two other reference marks (RM#3 and RM#4). RM#3 was found to be reading -0.001 feet low. RM#2 was not found and RM#4 was established to replace RM#2. RM#4 was established to be the top of the eye bolt in the left mass anchor at an elevation of 14.241 ft, gage datum. No corrections were made to gage heights of measurements or charts.

Rating.-- The control is an 8-foot Parshall flume installed in September 1979 to replace a V-notch weir. At an elevation of 3.00 ft, horizontal concrete wing walls extend in both directions for a total of 60 feet. Rating No. 4 was developed and put into use on October 1, 2003. It is fairly well defined between 22 cfs and 285 cfs. It was used all year. Thirteen measurements (Nos. 789 – 801) were made during the current water year ranging in discharge from 26.4 cfs to 127 cfs. They cover the range in discharge experienced except for the lower average daily flows of Dec. 16, 2008; Aug. 12, 22 – 23, 26 – 28, Sep. 2, 5, 7 – 8, 11 – 12, 2009, and the higher average daily flows of May 8 – 15, 19, 24; June 26, 2009. The peak instantaneous flow, occurred on June 26, 2009 at 0500 at a flow of 490 cfs (GH = 3.79 feet, Sh. = +0.01 feet) and exceeded measurement No. 795, made May 12, 2009, by 1.31 feet in stage.

Discharge.-- Shifting control method was used all year. Shifting is mainly caused by erosion and deposition of small to medium gravels in the approach section of the flume and by the accumulation of trash and debris on the wing walls. Shifts were applied as defined by measurements and were distributed by time with consideration of change in stage. Shifts were distributed by time from 0000 Oct. 1, 2008 until 0200 Oct. 5, 2008. This ends the shift transition from water year 2008 to 2009. Shift curve NAVSOCOVSO9 was used from Oct. 5, 2008 at 0300 through Aug. 2, 2009. On Aug. 2, 2009 the diversion dam upstream of the gage began to release water to meet the minimum bypass requirements at the gage. Large quantities of silts were released during this time causing the subsequent shift change at the gage. Shifts were distributed by time from 1100 Aug. 2, 2009 until the end of the water year. Measurements show unadjusted shifts varying from -0.05 to +0.08 ft. Three shifts were applied directly and given full weight. Measurement Nos. 790, 791, 792, 794, 795, 796, 797, 799, 800, & 801 were discounted between -6% and +4% to smooth shift distribution. No measurements were made during ice effect. It should be noted that measurement No. 795 (GH = 2.48 ft., Q = 127 cfs), which was the measurement with the highest discharge for the water year had its measured shift of -0.05 ft pushed to a shift of +0.01, causing a percentage difference of -5% in the discharge measurement. This was done because of the uncertainty in the measurement due to rapid change in stage and poor measurement conditions.

Special Computations.-- Discharge during ice-affected periods was estimated by considering baseflow discharge on either side of affected record period and smoothing the record between. Temperature data from NAVBANCO, located 6 miles upstream was the primary means of estimating discharge variation around the baseflow during ice-affected days

Remarks.-- Record good, except for those periods of ice affect which should be considered poor. Station operated and maintained by Div 7 staff and record developed by Brian Leavesley

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO

RATING TABLE--

NAVOSOCO04 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

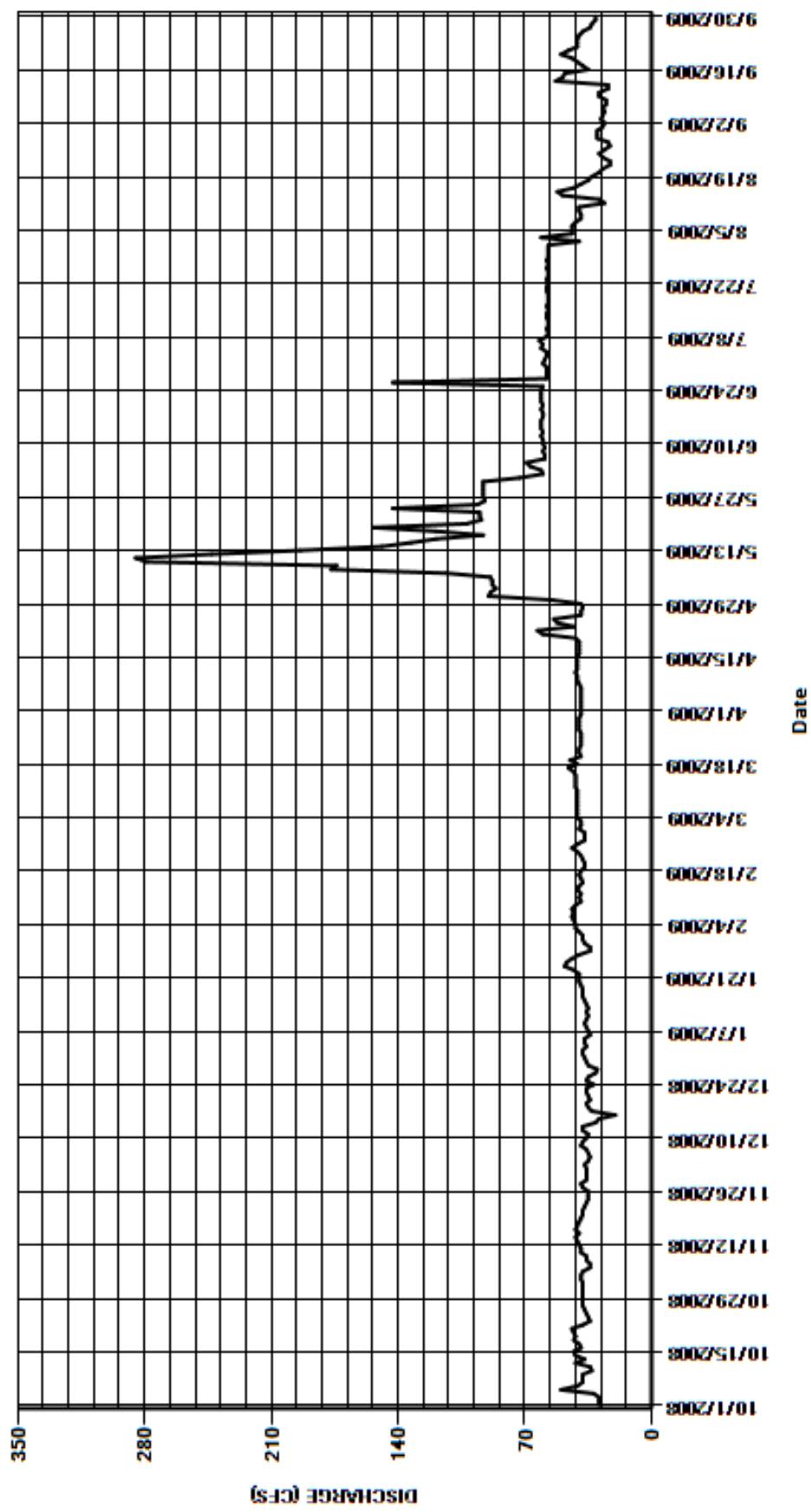
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	38	36	e38	e38	40	39	90	73	60	57	27
2	29	38	36	e38	e40	39	39	89	60	59	40	26
3	29	39	37	e36	42	39	39	86	61	58	61	28
4	32	39	35	e37	42	41	39	88	67	58	44	27
5	50	38	34	e37	43	41	39	88	69	61	44	26
6	41	34	35	e34	44	41	39	89	59	60	44	27
7	38	34	36	e35	43	41	39	113	59	62	42	25
8	38	36	39	e36	44	41	40	177	60	58	39	25
9	38	36	38	e37	42	41	41	174	59	57	39	29
10	33	39	36	e36	39	41	41	279	60	58	40	29
11	34	39	35	e35	40	41	42	285	60	57	40	24
12	42	40	38	e36	39	42	41	243	61	57	26	24
13	37	41	38	e35	41	42	41	194	60	58	29	53
14	42	42	e31	e36	40	42	41	149	61	58	49	49
15	43	40	e29	e37	38	42	41	133	61	57	52	48
16	39	42	e20	e38	39	43	40	119	61	58	43	35
17	40	41	e33	e38	40	46	40	93	60	57	39	38
18	43	40	e35	e38	39	41	40	119	60	57	35	41
19	42	39	e36	e39	37	45	40	154	61	57	33	44
20	43	38	e34	e40	37	39	42	102	60	58	29	50
21	44	38	e35	e40	38	40	60	94	61	58	27	46
22	38	37	e36	e40	39	40	63	95	61	57	23	41
23	34	36	e36	43	41	39	43	95	61	58	23	41
24	35	35	e32	48	44	39	52	143	61	57	27	41
25	36	35	e36	47	41	39	54	96	60	57	29	40
26	37	35	e35	44	37	39	39	92	143	58	26	38
27	38	38	e31	40	37	40	39	93	58	57	23	34
28	38	39	e30	34	37	40	38	93	58	58	24	33
29	38	36	e35	e34	---	40	39	93	58	57	30	31
30	38	36	e36	e37	---	40	55	93	58	57	30	31
31	38	---	e37	e38	---	39	---	93	---	57	30	---
TOTAL	1176	1138	1070	1181	1121	1263	1285	3944	1911	1796	1117	1051
MEAN	37.9	37.9	34.5	38.1	40	40.7	42.8	127	63.7	57.9	36	35
AC-FT	2330	2260	2120	2340	2220	2510	2550	7820	3790	3560	2220	2080
MAX	50	42	39	48	44	46	63	285	143	62	61	53
MIN	29	34	20	34	37	39	38	86	58	57	23	24
CAL YR	2008	TOTAL	18458	MEAN	50.4	MAX	231	MIN	20	AC-FT	36610	
WTR YR	2009	TOTAL	18053	MEAN	49.5	MAX	285	MIN	20	AC-FT	35810	

MAX DISCH: 490 CFS AT 05:00 ON Jun. 26,2009 GH 3.79 FT. SHIFT 0.01 FT.

MAX GH: 3.79 FT. AT 05:00 ON Jun. 26,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

0934400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
LITTLE OSO DIVERSION NEAR CHROMO
Water Year 2009

Location.-- Lat. 37°04'32", Long. 106°48'38", in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T.33 N., R.1 E., NMPM, Archuleta County.

Drainage and Period of Record.-- N/A. March 1971 to current year.

Equipment.-- Graphic water-stage recorder with Sutron Satlink 2 HDR DCP and shaft encoder on a separate float in a concrete shelter at a 6 foot Parshall flume.

Hydrographic Conditions.--

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with chart record and DCP data used for backup purposes. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the shaft encoder. The record is complete and reliable.

Datum Corrections.-- Levels were not run in WY 2009. It is unknown when levels were last run at the gage.

Rating.-- The control is a 6 ft concrete Parshall Flume. A standard 6-foot Parshall Flume rating table was used. The peak instantaneous flow occurred at 1915 Apr 24, 2009 (77.2 cfs, GH= 2.08 ft, shift=0.00 ft).

Discharge.-- No discharge measurements are made at this gage since the control structure is located underground. The standard Parshall flume rating with a zero shift applied was used to calculate the discharge. No discharge measurements have ever been made at the gage due to safety concerns.

Special Computations.-- None.

Remarks.-- The record is good. Station maintained by the USBR and record developed by Brian Boughton.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE OSO DIVERSION NEAR CHROMO

RATING TABLE--

LOSODVCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	37	0	0	0	0
2	0	0	0	0	0	0	1.5	40	0	0	0	0
3	0	0	0	0	0	0	2.4	29	0	0	0	0
4	0	0	0	0	0	0	2.9	20	0	0	0	0
5	0	0	0	0	0	0	2.5	23	0	0	0	0
6	0	0	0	0	0	0	2.7	34	0	0	0	0
7	0	0	0	0	0	0	3.5	45	0	0	0	0
8	0	0	0	0	0	0	6.7	50	0	0	0	0
9	0	0	0	0	0	0	0	10	51	0	0	0
10	0	0	0	0	0	0	0	10	49	0	0	0
11	0	0	0	0	0	0	0	11	47	0	0	0
12	0	0	0	0	0	0	0	10	44	0	0	0
13	0	0	0	0	0	0	0	9.8	39	0	0	0
14	0	0	0	0	0	0	0	11	32	0	0	0
15	0	0	0	0	0	0	0	11	27	0	0	0
16	0	0	0	0	0	0	0	10	22	0	0	0
17	0	0	0	0	0	0	0	10	18	0	0	0
18	0	0	0	0	0	3	9.3	18	0	0	0	0
19	0	0	0	0	0	2	10	18	0	0	0	0
20	0	0	0	0	0	11	19	14	0	0	0	0
21	0	0	0	0	0	16	41	16	0	0	0	0
22	0	0	0	0	0	19	52	23	0	0	0	0
23	0	0	0	0	0	18	53	18	0	0	0	0
24	0	0	0	0	0	10	57	21	0	0	0	0
25	0	0	0	0	0	7.7	59	15	0	0	0	0
26	0	0	0	0	0	6.7	52	9.4	0	0	0	0
27	0	0	0	0	0	4.2	49	6.9	0	0	0	0
28	0	0	0	0	0	3	52	4	0	0	0	0
29	0	0	0	0	---	1.4	57	2.3	0	0	0	0
30	0	0	0	0	---	0	52	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	102.00	677.30	772.60	0.00	0.00	0.00	0.00
MEAN	0	0	0	0	0	3.29	22.6	24.9	0	0	0	0
AC-FT	0	0	0	0	0	202	1340	1530	0	0	0	0
MAX	0	0	0	0	0	19	59	51	0	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

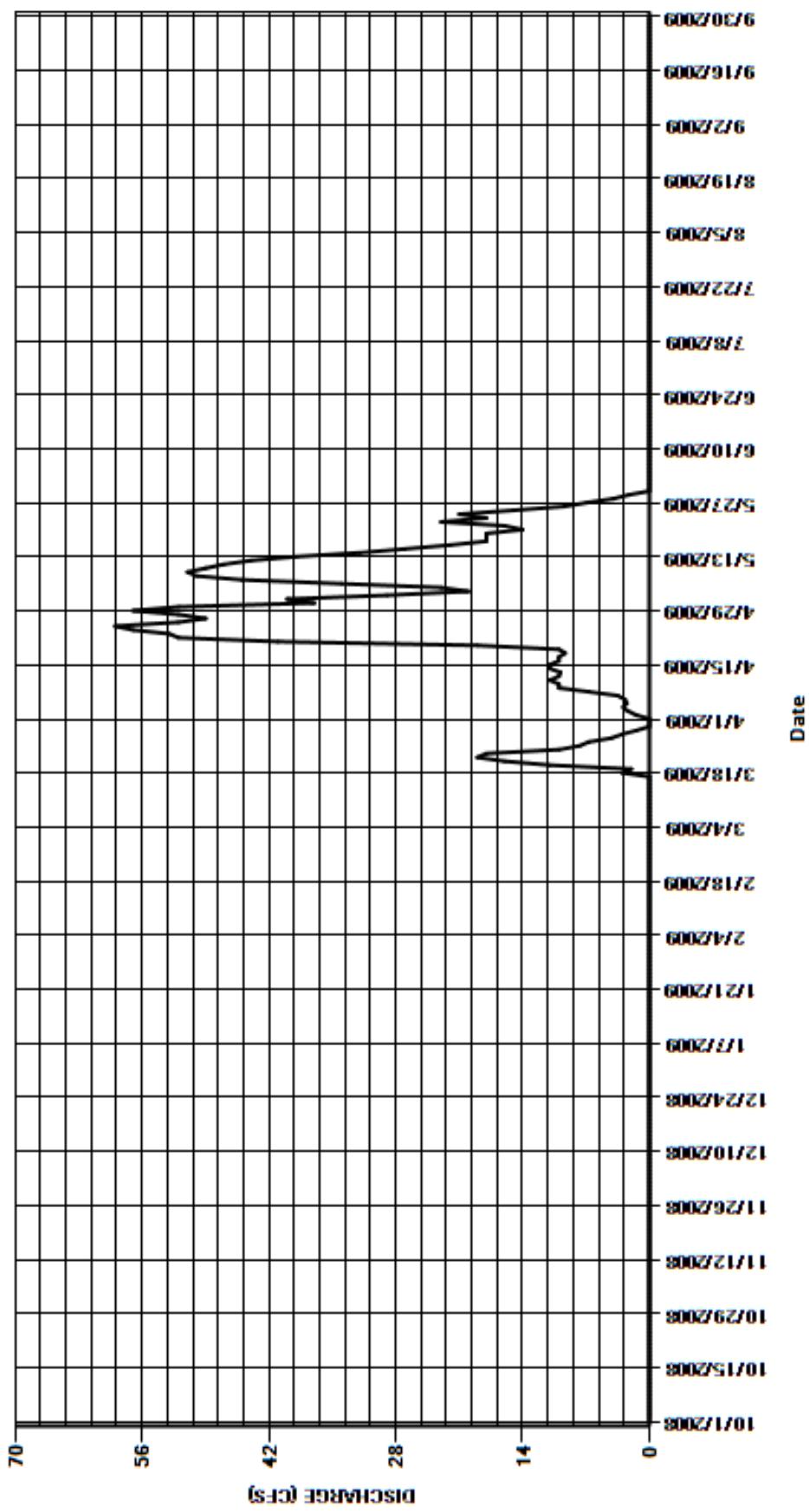
CAL YR	2008	TOTAL	2520.00	MEAN	6.89	MAX	72	MIN	0	AC-FT	5000
WTR YR	2009	TOTAL	1551.90	MEAN	4.25	MAX	59	MIN	0	AC-FT	3080

MAX DISCH: 77 CFS AT 19:15 ON Apr. 24,2009 GH 2.08 FT. SHIFT 0 FT.

MAX GH: 2.08 FT. AT 19:15 ON Apr. 24,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE OSO DIVERSION NEAR CHROMO
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DITCH
Water Year 2009

Location.--	Lat. 37°04'37.8", Long. 106°48'41.3", in SW 1/4 SE 1/4 sec. 23, T.33 N., R.1 E., NMPPM, Archuleta County, on right bank downstream from Little Oso Diversion Dam.
Drainage and Period of Record.--	N/A. December 5, 1996 to current year.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 DCP and shaft encoder on separate floats in a wooden shelter and concrete well. The primary reference gage is a drop tape in the gage with an outside staff gage used for supplemental purposes. Control is a steel 5-foot Parshall flume set in concrete. No changes.
Hydrographic Conditions.--	The channel is straight for approximately 80-ft up and downstream of the control. The gage is located approximately 80-ft downstream of the Little Oso diversion dam. A large CMP culvert is located approximately 80-ft downstream of the gage. Trash and debris can collect in front of the CMP culvert and submerge the flume. The channel consists of small cobbles and sand.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 31 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted once this water year. The adjustment made was -0.01 ft. Record is complete and reliable, except for the following days when ice on the control affected the stage-discharge relationship: Dec. 11, 14-15, 24, 26, 2008; and when the circuit breaker failed in the winter resulting in the heater in the gage house not operating and allowing the well to freeze with the recorder floats in the ice: Dec. 27, 2008 to March 17, 2009.
Datum Corrections.--	No levels were run this year. Levels have never been run at this gage.
Rating.--	The control is a 5-foot Parshall flume installed in October 1996 to supplement an inverted Cipolletti weir. Sandbars above the flume cause some shifting. Rating No. 1, a standard 5 foot Parshall flume rating, was used for the entire period of record. Twelve measurements (Nos. 181-192) were made during the current water year ranging in discharge from 0.99 cfs to 30.4 cfs. They cover the range-in-stage experienced, except for the lower average daily flow of Aug. 3, 2008; and the higher average daily flow of May 5, 2009. The instantaneous peak flow at 1415 on May 29, 2009 (41.4 cfs, GH = 1.62 ft, shift= -0.04 ft) exceeded measurement No. 186, made May 6, 2009, by 0.28 ft in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were distributed by stage with consideration given to change-in-stage. Shifts were distributed by stage using shift curve LITOSOCOV08A from 0000 Oct. 01, 2008 until 2359 Dec. 10, 2008. Shifts were distributed by time through the winter period by maintaining a -0.02 shift (0000 Dec. 11, 2008 until 2359 Mar. 17, 2009). Variable shift LITOSOCOV09A was distributed from 0000 Mar. 18, 2009 until the end of the water year. Shifting is mainly caused by erosion and deposition of sand and silts on the approach section above the flume. The USBR periodically opens the gate to the diversion stilling basin above the station and releases a large amount of silt and gravel upstream of the flume. Measurements show shifts varying from -0.06 to -0.02 feet. Shifts were applied directly and given full weight except Measurement Nos. 183, 188, and 189, were discounted from -7% to 4% to smooth shift distribution. The shift from measurement No. 182 was not used because there was not valid gage height as the floats were frozen in the well. Measurement No. 190 was not used because it was an outlier when compared to the other measurements made this water year.
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records from the Navajo River at Banded Peaks gage, partial days of good record and one discharge measurement No. 182. The chart hydrograph was also used to estimate periods of ice-affected record by chopping the peaks caused by ice on the control.
Remarks.--	Record fair, except for those periods of ice affected record and when the floats were frozen in the well, which should be considered poor. Station maintained by Sherry Schutz and record developed by Brian Leavesley.
Recommendations.--	Bench marks should be established and levels should be run at the gage. The level of the flume should be checked as well.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DITCH

RATING TABLE--

LITOSOCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.2	2.1	2.1	e1.7	e1.8	e2.2	7.2	29	23	6.5	1.2	1.6
2	2.2	2.1	2.2	e1.9	e1.7	e2.6	5.9	28	21	6.1	1	1.5
3	2.2	2.1	2.1	e1.7	e1.8	e3	5.9	28	20	5.9	0.96	1.7
4	2.4	2.1	2	e1.8	e1.9	e3.5	5.6	30	19	5.3	1.1	1.8
5	4.4	2	1.9	e1.7	e1.9	e4	5.3	31	19	5	1.2	1.9
6	3.2	1.5	2	e1.4	e2	e4.5	5.2	30	17	4.6	1.6	2.4
7	3	1.9	2	e1.4	e2.1	e4.5	7.6	30	16	4.2	2.3	1.8
8	2.6	2.3	2.2	e1.8	e2.1	e4.5	10	30	14	3.9	2.1	1.6
9	2.4	2.3	2.1	e1.9	e1.9	e5	7.8	30	13	3.7	2.1	2.1
10	2.3	2.3	2	e1.5	e1.7	e5	8	30	18	3.8	2	2.2
11	2.3	2.4	e2	e1.4	e1.7	e4.5	8.9	29	15	3.3	2	1.8
12	2.6	2.3	2.2	e1.5	e1.9	e5	6.2	29	12	2.9	2	1.8
13	2.4	2.4	2.2	e1.5	e1.8	e5.5	7.3	29	11	2.8	2	3.5
14	2.5	2.6	e1.8	e1.6	e1.7	e6	7.8	30	11	2.6	3.5	2.3
15	2.6	2.3	e1.6	e1.8	e1.8	e6.5	6.5	29	9.8	2.4	3.1	2
16	2.5	2.4	1.8	e1.8	e1.9	e7	6.7	29	9.3	2.2	2.3	1.8
17	2.4	2.3	2.1	e1.8	e1.8	e9	7	29	8.8	2	2.1	2
18	2.3	2.3	2	e1.8	e1.8	12	6	29	8.5	1.9	2.1	2.4
19	2.2	2.3	2	e1.9	e1.6	18	9	29	8.1	1.8	2	2.1
20	2.3	2.2	1.9	e2	e1.6	12	12	29	10	1.7	2	1.9
21	2.5	2	2	e1.9	e1.8	6.7	6.8	29	9.5	1.7	1.9	1.9
22	2.3	2	2.1	e2	e1.9	8	5	29	7.9	1.7	1.9	1.8
23	2	2	1.8	e2.1	e2.5	7.2	5	29	7.6	1.6	1.9	1.8
24	2.2	1.7	e1.6	e2.2	e2.4	6.8	5	29	9.4	1.6	2.3	1.8
25	2.2	2	1.8	e2.1	e2.5	6.8	5	29	12	1.4	2.1	1.8
26	2.2	2.2	e1.6	e2	e2.2	6.8	5	28	14	2	1.7	1.8
27	2.2	2.2	e1.5	e1.5	e2	6.8	5.1	28	9.5	1.5	1.7	1.7
28	2.2	2.1	e1.5	e1.5	e2	8	5.2	28	8.2	1.3	1.7	1.7
29	2.1	2.3	e1.6	e1.6	---	8.8	5.1	24	8.8	1.3	1.6	1.6
30	2.1	2.1	e1.7	e1.7	---	8	16	25	7.3	1.5	1.6	1.6
31	2.1	---	e1.7	e1.8	---	7.9	---	24	---	1.6	1.6	---
TOTAL	75.1	64.8	59.1	54.3	53.8	206.1	209.1	889	377.7	89.8	58.66	57.7
MEAN	2.42	2.16	1.91	1.75	1.92	6.65	6.97	28.7	12.6	2.9	1.89	1.92
AC-FT	149	129	117	108	107	409	415	1760	749	178	116	114
MAX	4.4	2.6	2.2	2.2	2.5	18	16	31	23	6.5	3.5	3.5
MIN	2	1.5	1.5	1.4	1.6	2.2	5	24	7.3	1.3	0.96	1.5

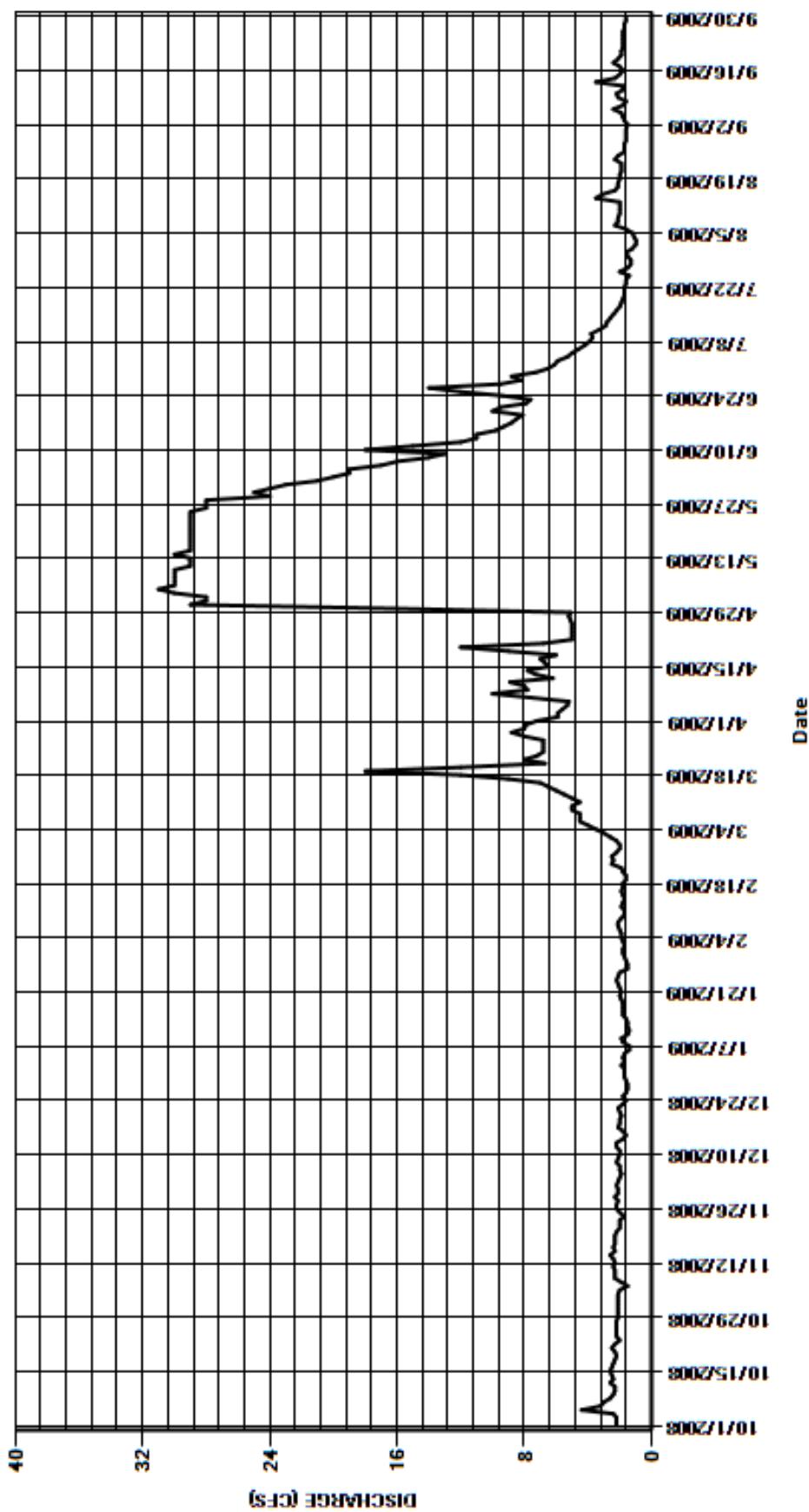
CAL YR	2008	TOTAL	2790.5	MEAN	7.62	MAX	36	MIN	1.5	AC-FT	5530
WTR YR	2009	TOTAL	2195.16	MEAN	6.01	MAX	31	MIN	0.96	AC-FT	4350

MAX DISCH: 41 CFS AT 14:15 ON May. 29,2009 GH 1.62 FT. SHIFT -0.04 FT.

MAX GH: 1.62 FT. AT 14:15 ON May. 29,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DITCH
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
Water Year 2009

Location.-- Lat. 37°25'36", Long. 107°40'28", in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, T.37 N., R.7 W., NMPM, La Plata County.

Drainage and Period of Record.-- 50.9 mi². July 1972 to current year.

Equipment.-- A graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float are located in a 72-inch by 72-inch exposed aggregate concrete shelter and a 42-inch corrugated metal pipe well. The floats are located inside of a 14-inch PVC oil cylinder. The station is also equipped with a Sutron air temperature sensor. The primary reference gage is an electric drop tape with a separate steel drop tape used when the well is frozen around the oil cylinder. No changes this water year.

Hydrographic Conditions.-- Large cobbles and boulders line the channel above and below the concrete ramp flume. The concrete ramp flume creates a large stilling pool above the control. Lemon Reservoir is below the gage but does not create backwater effect as the gage is well above the pool elevation in the reservoir.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record used for backup purposes. The gage was visited on 14 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. No shaft encoder adjustments were necessary this water year. The intakes were flushed on May 11, 2009 and resulted in a flush correction of +0.01 ft. The record is complete and reliable except for the following days when ice on the control affected the gage height: Dec. 16-29, 2008; Jan. 9 - 11, 21, Feb. 10-15, 2009.

Datum Corrections.-- Levels were not run this water year. Levels were last run on July 31, 2008 to the electric tape reference (ET), located inside the gage shelter, using BM2 as the base. Bench mark #2 (BM2) is a square chiseled into a large boulder located 3.5 ft. south of the bank operated cableway. The electric tape index was found to be reading +0.003 ft. high. The electric tape length was found to be reading 0.03 ft. long. No changes were made.

Rating.-- On April 2, 2002 a long throated flume, hereafter referred to as a "Ramp Flume" was activated to act as the control section for the gage. The control section is located about 75 feet below the inlets to the old gage and 5 feet below the new gage. Rating No. 7, in use since April 4, 2006, was continued in use for the duration of WY 2009. It is fairly well defined from 8.80 to 999 cfs. Fourteen measurements (Nos. 613 - 626) were made during the water year. They range in discharge from 8.48 to 544 cfs. They cover the range in stage experienced, except for the lower average daily flows of Dec. 15, 2008, Jan. 10, Jan. 27, Feb. 19 - 20, Aug. 20 - 23, 29 - 31, and Sept. 1-5, 2009, and the higher average daily flows of May 7-15, 2009. The peak instantaneous flow was at 20:45 on May 11, 2009 (941 cfs, GH = 3.84 ft, shift = -0.02 ft) and exceeded the stage of measurement No. 618, by 0.57 feet in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifting is caused mainly by aquatic growth on the ramp flume and the fill and scour of sand and gravel above the concrete ramp flume. Measurements show shifts varying from -0.07 to +0.06 feet. Shifts were distributed by stage during the entire water year, using variable shift curve FLOALECOVS09. No measurements were made during the ice affected period. Shifts were applied directly and given full weight except measurement Nos. 613, 614, 615, 619, 620, 624, 625, 626, which were discounted from -10% to 11% to smooth shift distribution. The shift for measurement No. 623 was anomalous compared to other shifts for the water year and therefore was not used.

Special Computations.-- Discharge for periods of ice affect were estimated on the basis of partial day record, interim good record, and temperature data obtained from a temperature sensor at the gage house.

Remarks.-- Record good, except for estimated daily discharges during ice affect, which are poor. Station operated and maintained by Div 7 staff and record developed by Jason Morrow.

Recommendations.-- A bubbler should be installed at the gage to maintain good record during high flow events and winter periods.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO

RATING TABLE--

FLOALECO07 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

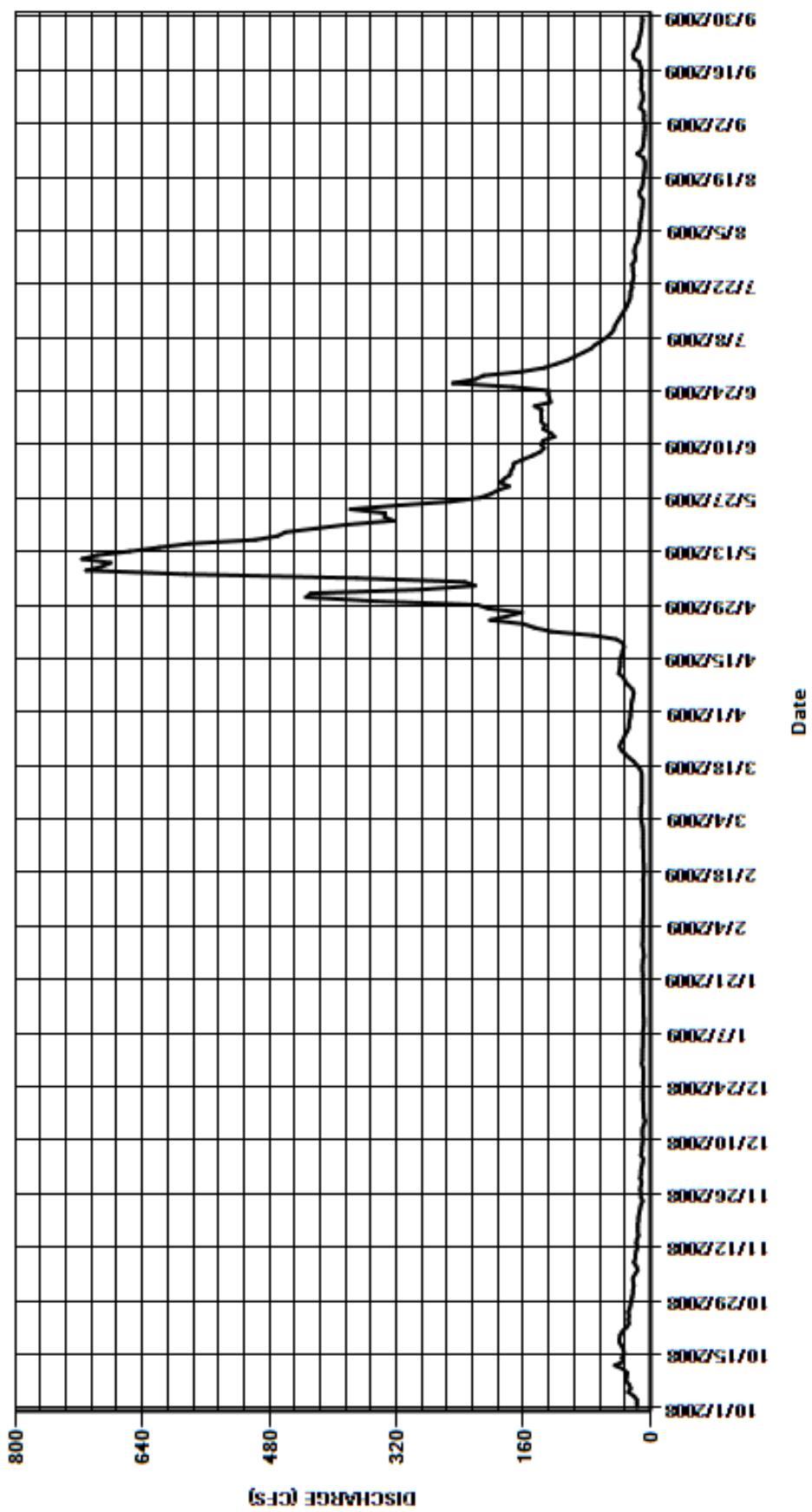
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	22	12	10	9.2	9.7	25	434	184	119	19	7.2
2	17	21	12	9.9	9.2	10	24	428	177	105	16	7.3
3	17	22	11	9.9	9.5	11	24	289	176	95	15	8.3
4	21	22	9.9	9.6	9.4	12	23	221	173	85	14	7.9
5	28	19	9	9.4	9.5	12	22	234	172	75	13	8.3
6	25	16	12	9.2	9.3	12	21	370	161	70	13	13
7	27	18	11	9.8	9.1	12	23	586	149	62	13	12
8	31	21	11	9.1	8.9	11	28	711	139	55	12	9.9
9	30	19	10	e8.5	9	11	32	691	134	50	11	9.4
10	29	19	9.8	e8.3	e8.8	11	34	680	138	46	11	10
11	34	18	9.9	e8.5	e8.6	11	40	716	135	45	10	12
12	45	16	10	9.1	e9	11	39	697	121	42	9.7	11
13	34	18	10	8.8	e8.8	11	38	656	126	39	9.4	12
14	36	17	8.1	8.9	e8.6	11	38	619	135	36	13	11
15	33	15	6.9	8.8	e9	11	38	581	133	33	14	11
16	34	16	e8.5	8.8	9.4	11	36	498	138	30	11	11
17	36	16	e8.7	9.2	8.6	13	35	470	137	28	9.8	13
18	39	16	e9	9.5	8.5	17	33	460	138	26	9.2	14
19	39	15	e9	9.5	8	21	35	421	137	25	8.6	21
20	38	15	e9.2	9.8	8.3	27	43	382	146	25	7.9	22
21	35	14	e9.5	e9.6	8.9	32	72	324	126	23	7.3	20
22	30	13	e9.5	9.5	8.6	37	125	335	127	24	7	16
23	27	12	e9.5	9.9	9	39	146	334	129	22	7.2	15
24	28	9.8	e9	9.9	9.3	37	160	378	128	21	8.9	14
25	27	12	e9.5	9.9	9.5	34	202	319	173	22	17	13
26	28	12	e9	9.7	9.4	32	181	252	249	22	11	12
27	26	13	e9	8	9.5	29	162	215	221	23	9.4	11
28	25	12	e9	8.7	9.3	27	204	201	210	20	8.7	11
29	24	11	e9.5	9.3	---	27	218	192	162	19	8.3	10
30	23	13	11	10	---	26	351	178	134	20	7.7	11
31	22	---	10	9.8	---	25	---	189	---	20	7.3	---
TOTAL	905	482.8	301.5	288.9	252.2	600.7	2452	13061	4608	1327	339.4	364.3
MEAN	29.2	16.1	9.73	9.32	9.01	19.4	81.7	421	154	42.8	10.9	12.1
AC-FT	1800	958	598	573	500	1190	4860	25910	9140	2630	673	723
MAX	45	22	12	10	9.5	39	351	716	249	119	19	22
MIN	17	9.8	6.9	8	8	9.7	21	178	121	19	7	7.2
CAL YR	2008	TOTAL	32542.6	MEAN	88.9	MAX	752	MIN	6.9	AC-FT	64550	
WTR YR	2009	TOTAL	24982.8	MEAN	68.4	MAX	716	MIN	6.9	AC-FT	49550	

MAX DISCH: 941 CFS AT 20:45 ON May. 11,2009 GH 3.84 FT. SHIFT -0.02 FT.

MAX GH: 3.84 FT. AT 20:45 ON May. 11,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
FLORIDA RIVER BELOW LEMON RESERVOIR
Water Year 2009

Location.-- Lat. 37°22'50", Long. 107°39'43", in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.36 N., R.7 W., NMPM, La Plata County

Drainage and Period of Record.-- 69.1 mi².

Equipment.-- Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 42" corrugated metal shelter and well. The primary reference gage is a steel drop tape referenced to a nonadjustable flat head screw set into the wooden instrument shelf. An electric tape is a redundant reference and should be removed from the gage. The gage is located within the stilling pool below the reservoir. The control is a concrete broad crested weir located approximately 200 ft. below the gage. A bank operated cableway is located approximately 400 ft. below the gage.

Hydrographic Conditions.-- The weir below Lemon Reservoir creates a large stilling pool below Lemon Reservoir dam. Flow in the channel is controlled by releases from the reservoir.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 14 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was not adjusted this water year. The record is complete and reliable.

Datum Corrections.-- Levels were not run this water year. Levels were last run on July 31, 2008 to the nonadjustable reference (RP), located inside the gage shelter using BM1 as the base. The drop tape reference was found to be reading -0.003 ft. low. The drop tape reference was not adjusted as it was found to be within the allowable error tolerances. The drop tape length was reading correct and not adjusted.

Rating.-- The control is a concrete broad-crested weir located 200 ft. below the gage. Shifts occur as a result of moss growth on the weir. Rating No. 2, dated Jan. 11, 1977, was continued in use this year. It is well defined from 0.6 to 980 cfs. The point-of-zero-flow (PZF) was measured once this water year. The PZF was found to be approximately 1.13 ft. Eleven measurements (Nos. 488 - 498) were made during the current water year ranging in discharge from 9.40 cfs to 355 cfs. These measurements cover the range in stage experienced except for the lower average daily flows on Apr. 21 and May 7, 2009 and the higher average daily flows of May 16-25, 2009. The peak flow of 510 cfs, which occurred at 1130 on May 16, 2009, at a gage height of 3.96 ft. and a shift of +0.04, exceeded the gage height of measurement No. 492, made May 21, 2009 by 0.41 feet.

Discharge.-- Shifting control method was used, with shifts distributed by stage for the entire water year. Open water measurements show shifts varying from -0.06 to +0.04 feet. Shifts were distributed using variable shift curve FLOBLE08VSA from 0000 October 1 to 1142 October 17, 2008. Variable shift curve 08VSA transitions the shifts from water year 2008 until the first measurement in water year 2009. Variable shift curve FLOBLE09VSA was defined by measurement nos. 488 to 497 and applied from 1200 October 17, 2008 until 1249 August 27, 2009. Moss growth on the control impacted the shifts in the late summer months, thus variable shift curve FLOBLE09VSB was applied from 1300 August 27, 2009 until the end of the water year. Shifts from measurement Nos. 490, 496, 497 and 498 were discounted to smooth shift distribution. Shifts were discounted -5% to +2%. Measurement no. 490 was discounted -11% to match the shifts for measurement nos. 488, 489 and 491.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- Record good. Station maintained and record developed by Brian Boughton.

Recommendations.-- The electric tape should be removed since the drop tape is the primary reference.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

FLORIDA RIVER BELOW LEMON RESERVOIR

RATING TABLE--

FLOBLECO02 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

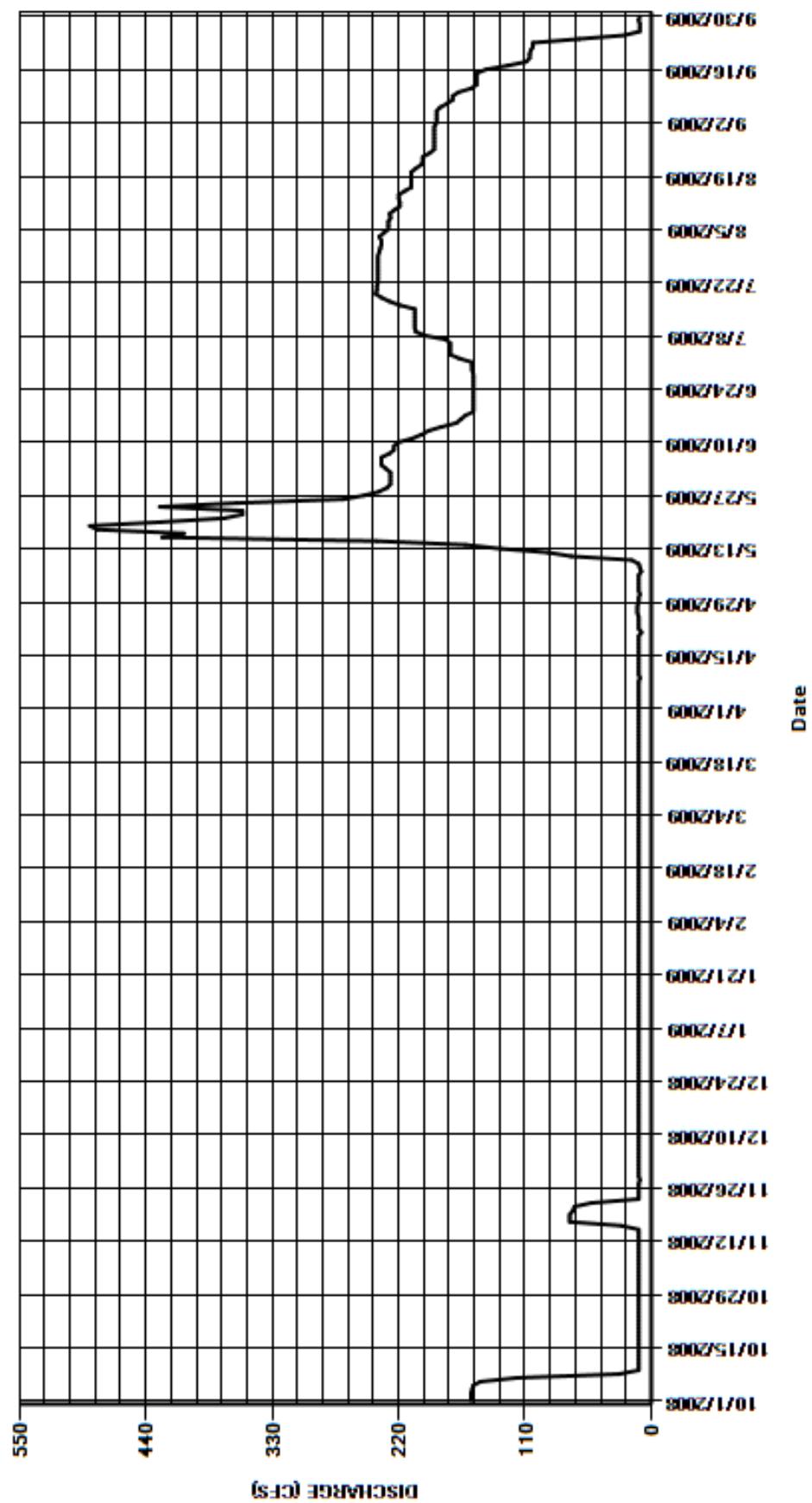
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	157	11	11	11	11	11	11	10	227	156	235	189
2	157	11	11	11	11	11	11	11	227	167	235	187
3	157	11	11	11	11	11	11	11	231	175	237	187
4	156	11	11	11	11	11	11	11	235	175	233	187
5	155	11	11	11	11	11	11	11	235	175	229	187
6	149	11	11	11	11	11	11	11	235	175	229	184
7	117	11	11	11	11	11	11	8.8	228	179	229	178
8	28	11	11	11	11	11	11	10	224	197	227	173
9	11	11	11	11	11	11	10	11	224	205	228	173
10	11	11	11	11	11	11	11	17	220	206	224	168
11	11	11	11	11	11	11	11	70	208	206	219	157
12	11	11	11	11	11	11	11	90	200	206	219	152
13	11	11	11	11	11	11	11	131	194	206	220	152
14	11	11	11	11	11	11	11	162	183	206	220	152
15	11	11	11	11	11	11	11	239	170	206	215	152
16	11	26	11	11	11	11	11	426	166	219	209	144
17	11	71	11	11	11	11	11	407	162	228	209	125
18	11	71	11	11	11	11	11	482	155	235	209	109
19	11	71	11	11	11	11	11	489	155	240	209	106
20	11	68	11	11	11	11	11	427	155	239	209	106
21	11	67	11	11	11	11	8.6	372	155	239	205	105
22	11	52	11	11	11	11	11	356	155	238	200	103
23	11	11	11	11	11	11	11	356	155	238	199	103
24	11	11	11	11	11	11	11	428	155	238	199	63
25	11	11	11	11	11	11	11	361	155	238	193	23
26	11	11	11	11	11	11	12	268	155	238	189	10
27	11	11	11	11	11	11	12	250	155	238	189	10
28	11	10	11	11	11	11	12	237	155	238	189	10
29	11	11	11	11	---	11	11	230	156	238	189	11
30	11	11	11	11	---	11	11	227	156	237	189	10
31	11	---	11	11	---	11	---	227	---	236	189	---
TOTAL	1329	678	341	341	308	341	329.6	6346.8	5586	6617	6574	3616
MEAN	42.9	22.6	11	11	11	11	11	205	186	213	212	121
AC-FT	2640	1340	676	676	611	676	654	12590	11080	13120	13040	7170
MAX	157	71	11	11	11	11	12	489	235	240	237	189
MIN	11	10	11	11	11	11	8.6	8.8	155	156	189	10
CAL YR	2008	TOTAL	41718.0	MEAN	114	MAX	643	MIN	8.3	AC-FT	82750	
WTR YR	2009	TOTAL	32407.4	MEAN	88.8	MAX	489	MIN	8.6	AC-FT	64280	

MAX DISCH: 510 CFS AT 11:30 ON May. 16,2009 GH 3.96 FT. SHIFT 0.04 FT.

MAX GH: 3.96 FT. AT 11:30 ON May. 16,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

FLORIDA RIVER BELOW LEMON RESERVOIR
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
09357500 ANIMAS RIVER NEAR HOWARDSVILLE
Water Year 2009

Location.--	Lat. 37°49'59", Long. 107°35'56", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T.41 N., R.7 W., NMPM, San Juan County
Drainage and Period of Record.--	55.9 mi ² . May 1936 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 36"x 36" wooden shelter and well. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). An air temperature sensor is located at the gage as well. No changes this water year.
Hydrographic Conditions.--	Cobbles and boulders line the channel above and below the gage. Very few diversions exist above the gage. Avalanches above the gage can diminish the flows at the gage but the events are usually short lived.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 17 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov. 7, Dec. 5, 9-12, 14-21, 24, 26-28, 31, 2008; Jan. 1, 10-11, 13, 15-21, 26-31, Feb. 1-2, 4-5, 9-22, 27-28, Mar. 5-8, 10-11, 14, 16, 27-28, 31, Apr. 2, 5-6, 2009.
Datum Corrections.--	Levels were not run this water year. Levels were last run on July 15, 2008, using BM1 as the base. The drop tape reference was found to be reading +0.007 ft. high. No changes were made.
Rating.--	The control is a large cobble riffle located below the station. The channel is the control at high flow. Gravel and sand fill and scour, causing shifts. Rating No. 8, dated Oct. 1, 1993, was used this water year until May 13, 2009. It is fairly well defined from 15.3 to 1050 cfs. Rating No. 9 was created and put into use on May 13, 2009, just prior to the high water measurement for the year, and used for the remainder of the water year. Seventeen measurements (Nos. 1169 - 1185) were made during the current water year ranging in discharge from 14.8 to 682 cfs. They cover the range in stage experienced except for the lower average daily flows of Feb. 2 -14, 17-19, 22-28; Mar. 1-15, 2009, and the higher average daily flows of May 11-20; June 26 2009. The peak flow of 1200 cfs had a corresponding gage height of 3.64 ft. and a shift of 0.03 ft. This peak occurred on May 17, 2009 at 20:45 and exceeded measurement No. 1177 by 0.70 ft. in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition of small cobble and gravels on the control section below the gauge. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from 0000 on October 1, 2008 to 1436 on October 07, 2008. Shift curve ANIHOWCOVS09A was applied from this point to May 13, 2009, just prior to measurement No. 1177 and the transition to rating curve No. 9. At this time, shift curve ANIHOWCO09B was applied and continued for the remainder of the water year. Unadjusted measurements show shifts varying from -0.05 to 0.07 ft. Eight of 17 shifts were applied directly and given full weight. The remaining nine shifts, associated with measurement Nos. 1173, 1174, 1175, 1176, 1178, 1179, 1180, 1184, and 1185, were discounted from -6% to +5% to smooth shift distribution. Measurement Nos. 1170 and 1181 were not applied due to anomalous results that did not fit within the trend for the water year.
Special Computations.--	Discharge for periods of ice-affected gage heights were estimated on the basis of partial day records and air temperature data collected at the site.
Remarks.--	Record good, except for the winter periods affected by ice, which should be considered poor. Station operated and maintained by and record developed by Jason Morrow.
Recommendations.--	Currently the existing cable way is a wooden "A" frame with a suspended cable and cable car. The cable car is a wooden -person sit-down car with real mount. For safety reasons the existing cableway should be removed and a new bank-operated cable way should be installed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09357500 ANIMAS RIVER NEAR HOWARDSVILLE

RATING TABLE--

ANIHOWCO08 USED FROM 01-Oct-2008 TO 13-May-2009
ANIHOWCO09 USED FROM 13-May-2009 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

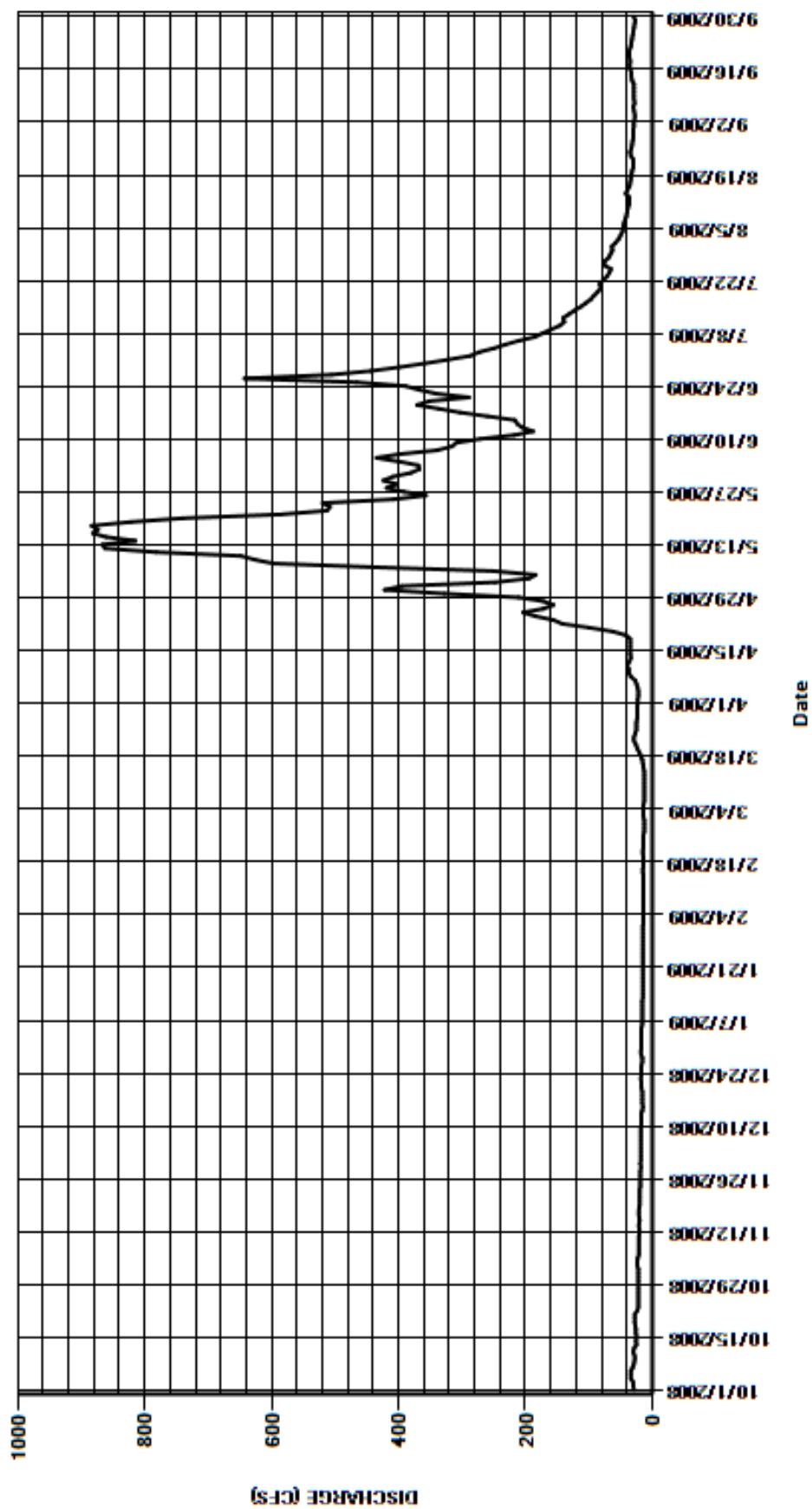
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	22	18	e17	e15	13	23	422	381	322	58	29
2	30	22	18	17	e14	14	e23	395	367	287	53	29
3	30	24	18	17	14	14	22	248	369	273	50	28
4	34	24	18	17	e14	14	22	195	399	250	47	28
5	34	23	e18	17	e14	e14	e23	184	435	232	46	29
6	34	21	18	16	14	e13	e25	251	397	211	45	30
7	31	e21	18	16	14	e13	27	436	339	186	43	28
8	29	21	18	16	14	e13	34	598	316	173	41	29
9	28	21	e18	16	e14	13	37	627	309	160	40	29
10	28	21	e18	e16	e14	e13	37	649	271	146	39	29
11	30	21	e17	e16	e14	e13	40	782	218	139	37	29
12	29	20	e17	16	e14	13	36	863	188	141	36	29
13	25	21	18	e15	e14	13	34	867	205	132	36	32
14	26	21	e16	15	e14	e13	35	815	213	123	42	33
15	25	20	e15	e15	e15	14	35	861	217	113	39	33
16	26	21	e16	e15	e15	e15	35	882	260	105	36	35
17	26	21	e16	e15	e14	16	35	874	303	97	35	36
18	27	21	e16	e15	e14	18	35	884	337	92	34	35
19	28	20	e16	e15	e14	21	42	822	371	86	33	36
20	28	20	e17	e15	e15	24	63	740	352	81	32	36
21	28	20	e17	e15	e15	26	100	586	289	83	30	36
22	24	20	18	15	e14	29	142	513	341	78	30	34
23	22	20	18	15	14	29	156	508	367	72	30	33
24	22	19	e17	15	14	27	184	520	389	68	34	32
25	22	19	17	15	14	25	204	408	466	65	35	31
26	22	19	e17	e15	13	25	172	357	643	76	33	30
27	22	19	e16	e15	e13	e25	156	392	506	76	32	29
28	22	19	e16	e15	e13	e24	172	419	444	69	31	28
29	22	18	18	e15	---	24	211	403	399	66	30	27
30	22	19	18	e15	---	24	328	424	359	63	30	30
31	22	---	e17	e15	---	e24	---	409	---	64	30	---
TOTAL	827	618	533	482	394	576	2488	17334	10450	4129	1167	932
MEAN	26.7	20.6	17.2	15.5	14.1	18.6	82.9	559	348	133	37.6	31.1
AC-FT	1640	1230	1060	956	781	1140	4930	34380	20730	8190	2310	1850
MAX	34	24	18	17	15	29	328	884	643	322	58	36
MIN	22	18	15	15	13	13	22	184	188	63	30	27

CAL YR	2008	TOTAL	41972	MEAN	115	MAX	916	MIN	14	AC-FT	83250
WTR YR	2009	TOTAL	39930	MEAN	109	MAX	884	MIN	13	AC-FT	79200

MAX DISCH: 1200 CFS AT 20:45 ON May. 17,2009 GH 3.64 FT. SHIFT 0.03 FT.
MAX GH: 3.64 FT. AT 20:45 ON May. 17,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09357500 ANIMAS RIVER NEAR HOWARDSVILLE
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS
Water Year 2009

Location.-- Lat. 37°19'26", Long. 108°03'41", in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 3, T.35 N., R.11 W., NMPM, La Plata County.

Drainage and Period of Record.-- N/A

Equipment.-- A Sutron Satlink 2 DCP with a shaft encoder in a wood shelter and 22" x 22" concrete well. Primary reference gage is a staff gage located on the inside of the stilling well. Control is a 5-foot concrete Parshall flume. No changes this year.

Hydrographic Conditions.-- The ditch above and below the control is sand, gravel, cobble, and sparse boulders with a very well defined stilling pool. The approach conditions into the flume are good. Vegetative growth downstream of the flume rarely causes submergence but beavers have been known to build dams downstream of the flume.

Gage-Height Record.-- The primary record is hourly averages of 15-minute DCP log data with satellite data as backup. The gage was visited on 5 separate occasions this water year to verify the shaft encoder remained calibrated to the primary reference. Two adjustments were made to the shaft encoder. One on May 7, 2009 (+0.03 ft correction) and one on June 5, 2009 (-0.02 ft correction). Record is complete and reliable except for September 30, 2009 when the shaft encoder float was stuck in mud. Diversion was based on the water commissioner estimate as he turned water into the ditch.

Datum Corrections.-- Levels were not run this water year. Levels were last run on August 22, 2008 to the inside staff gage. The staff gage was found to be reading 0.006-ft high. No corrections were made as the staff gage was found to be within allowable tolerances.

Rating.-- The control is a standard 5-foot concrete Parshall flume. Rating No. 01, in use since the gage was installed, was used all year. Four discharge measurements (Nos. 32-35) were made this year, ranging in discharge from 8.38 cfs to 28.1 cfs. An observation of zero flow was made on October 1, 2008. Measurements and observation of zero flow cover the range-in-stage experienced except for higher average daily flows of May 24 – June 5, 2009. The peak instantaneous flow at 2030 on May 24, 2009 (35.7 cfs, GH = 1.33 ft, shift = 0.11 ft, w/ -0.01 D.C. applied) exceeded the stage of measurement No. 33, made June 5, 2009 by 0.18 feet in stage.

Discharge.-- Shifting control method was used all water year. Shifts were applied by stage for the entire water year using variable shift curve LPCDITCO09VSB. The Parshall flume has a positive longitudinal slope (the throat is lower than the entrance of the converging section). The positive longitudinal slope causes the positive shifts. Measurements are made at the well intake. Open-water measurements showed shifts varying between +0.01 and +0.09 feet. All measurements were given full weight except for measurements Nos. 32, 34, and 35 which were discounted -6% to 5% to smooth shift distribution.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- Record is complete, reliable and good except for September 30, 2009 when the float was stuck in mud. Record on this day is estimated and should be considered poor. Station maintained by Brian Boughton and record developed by Brian Leavesley.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS

RATING TABLE--

LPCDITCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

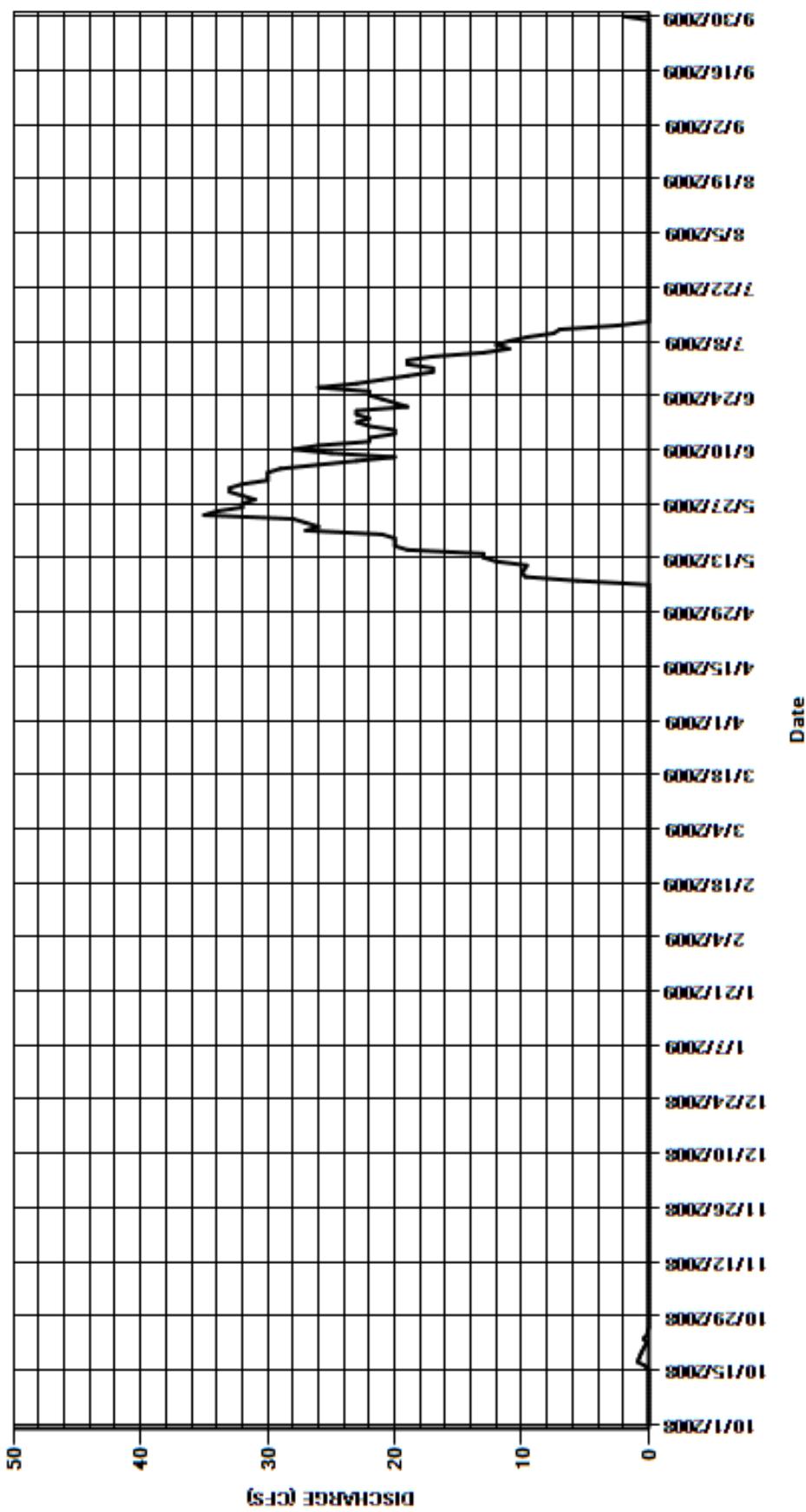
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	32	17	0	0
2	0	0	0	0	0	0	0	0	30	19	0	0
3	0	0	0	0	0	0	0	0	30	19	0	0
4	0	0	0	0	0	0	0	0	30	17	0	0
5	0	0	0	0	0	0	0	0	29	13	0	0
6	0	0	0	0	0	0	0	0	26	11	0	0
7	0	0	0	0	0	0	0	5.6	23	12	0	0
8	0	0	0	0	0	0	0	9.7	20	11	0	0
9	0	0	0	0	0	0	0	10	25	9.6	0	0
10	0	0	0	0	0	0	0	9.8	28	7.5	0	0
11	0	0	0	0	0	0	0	9.6	26	7	0	0
12	0	0	0	0	0	0	0	12	22	2.5	0	0
13	0	0	0	0	0	0	0	13	22	0	0	0
14	0	0	0	0	0	0	0	13	20	0	0	0
15	0	0	0	0	0	0	0	19	20	0	0	0
16	0.3	0	0	0	0	0	0	20	22	0	0	0
17	0.89	0	0	0	0	0	0	20	23	0	0	0
18	0.76	0	0	0	0	0	0	20	22	0	0	0
19	0.64	0	0	0	0	0	0	21	23	0	0	0
20	0.49	0	0	0	0	0	0	27	23	0	0	0
21	0.33	0	0	0	0	0	0	26	19	0	0	0
22	0.14	0	0	0	0	0	0	27	20	0	0	0
23	0.42	0	0	0	0	0	0	28	21	0	0	0
24	0.13	0	0	0	0	0	0	35	22	0	0	0
25	0.09	0	0	0	0	0	0	34	22	0	0	0
26	0	0	0	0	0	0	0	32	26	0	0	0
27	0	0	0	0	0	0	0	32	23	0	0	0
28	0	0	0	0	0	0	0	31	21	0	0	0
29	0	0	0	0	---	0	0	32	19	0	0	0
30	0	0	0	0	---	0	0	33	17	0	0	e2
31	0	---	0	0	---	0	---	33	---	0	0	---
TOTAL	4.19	0.00	0.00	0.00	0.00	0.00	0.00	552.70	706	145.60	0.00	2.00
MEAN	0.14	0	0	0	0	0	0	17.8	23.5	4.7	0	0.067
AC-FT	8.3	0	0	0	0	0	0	1100	1400	289	0	4
MAX	0.89	0	0	0	0	0	0	35	32	19	0	2
MIN	0	0	0	0	0	0	0	0	17	0	0	0

CAL YR	2008	TOTAL	1683.59	MEAN	4.6	MAX	39	MIN	0	AC-FT	3340
WTR YR	2009	TOTAL	1410.49	MEAN	3.86	MAX	35	MIN	0	AC-FT	2800

MAX DISCH: 36 CFS AT 20:30 ON May. 24,2009 GH 1.33 FT. SHIFT 0.11 FT. (GH CORR. -0.01 FT APPLIED)
 MAX GH: 1.33 FT. AT 20:30 ON May. 24,2009 (GH CORR. -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LAPLATA AND CHERRY CREEK DITCH NEAR HESPERUS
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
PINE RIDGE DITCH NEAR HESPERUS
Water Year 2009

Location.-- Lat. 37°17'31", Long. 108°02'07", in SW¼NE¼ sec. 14, T.35 N., R.11 W., NMPM, La Plata County.

Drainage and Period of Record.-- N/A

Equipment.-- A Sutron Stage Discharge Recorder (SDR) and a Sutron Satlink DCP with a shaft encoder on a separate float in a 30" diameter corrugated metal well and a 42" diameter corrugated metal shelter. Primary reference gage is outside staff gage installed in flume. Control is a 3-foot steel Parshall flume. No other changes this year.

Hydrographic Conditions.-- The ditch above and below the control is silt with a very well defined stilling pool. The approach conditions into the flume are good. Vegetative growth downstream of the flume can cause submergence if the ditch is not maintained. On April 29, 2008 a 34" X 50" elliptical corrugated metal pipe was installed in the ditch approximately 200-ft below the gage. The larger culvert appears to be adequate and allows the flume to operate under free-flow conditions. The culvert was installed to access the Indian Shadows subdivision.

Gage-Height Record.-- The primary record is hourly averages of 15 minute DCP log file data with the SDR and satellite data used for backup purposes. Record is complete and reliable except for the period Mar. 16-17 when ice blocked the culvert downstream and submerged the flume. No flush corrections or datum corrections were necessary this water year.

Datum Corrections.-- Levels were last run on August 22, 2008. Levels were not run in water year 2009.

Rating.-- The control is a standard, 3-foot, steel Parshall flume. Rating No. 01 in use since the gage was installed was used all water year. Rating No. 01 is a standard 3-ft Parshall flume rating above a gage height of 0.06-ft. For gage heights below 0.06-ft, the well become isolated as the highest flow line of the intake is 0.06-ft. above the floor of the flume at the staff gage. One discharge measurement, No. 16, was made this year at a discharge of 10.8 cfs. Observations of zero flow were made on March 16, 2009, July 2, 2009 and August 24, 2009. Measurements and observation of zero flow cover the range-in-stage except for the higher daily flows of March 28-31, April 1 and May 8, 2009. The peak instantaneous flow at 2015 May 1, 2009 (13.0 cfs, GH = 1.05 ft, shift= 0.00 ft) exceeded the stage of measurement No. 16, made May 7, 2009 by 0.11 feet in stage.

Discharge.-- Measurements are made at the staff gage and well intake, in the flume. Shifts were applied by time. All shifts made were given full weight.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- Record good, except for the few hours on March 16 and 17 when the flume was submerged. Record during this period should be considered poor. Station maintained by Div 7 Staff and record developed by Brian Boughton.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PINE RIDGE DITCH NEAR HESPERUS

RATING TABLE--

PINDITCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

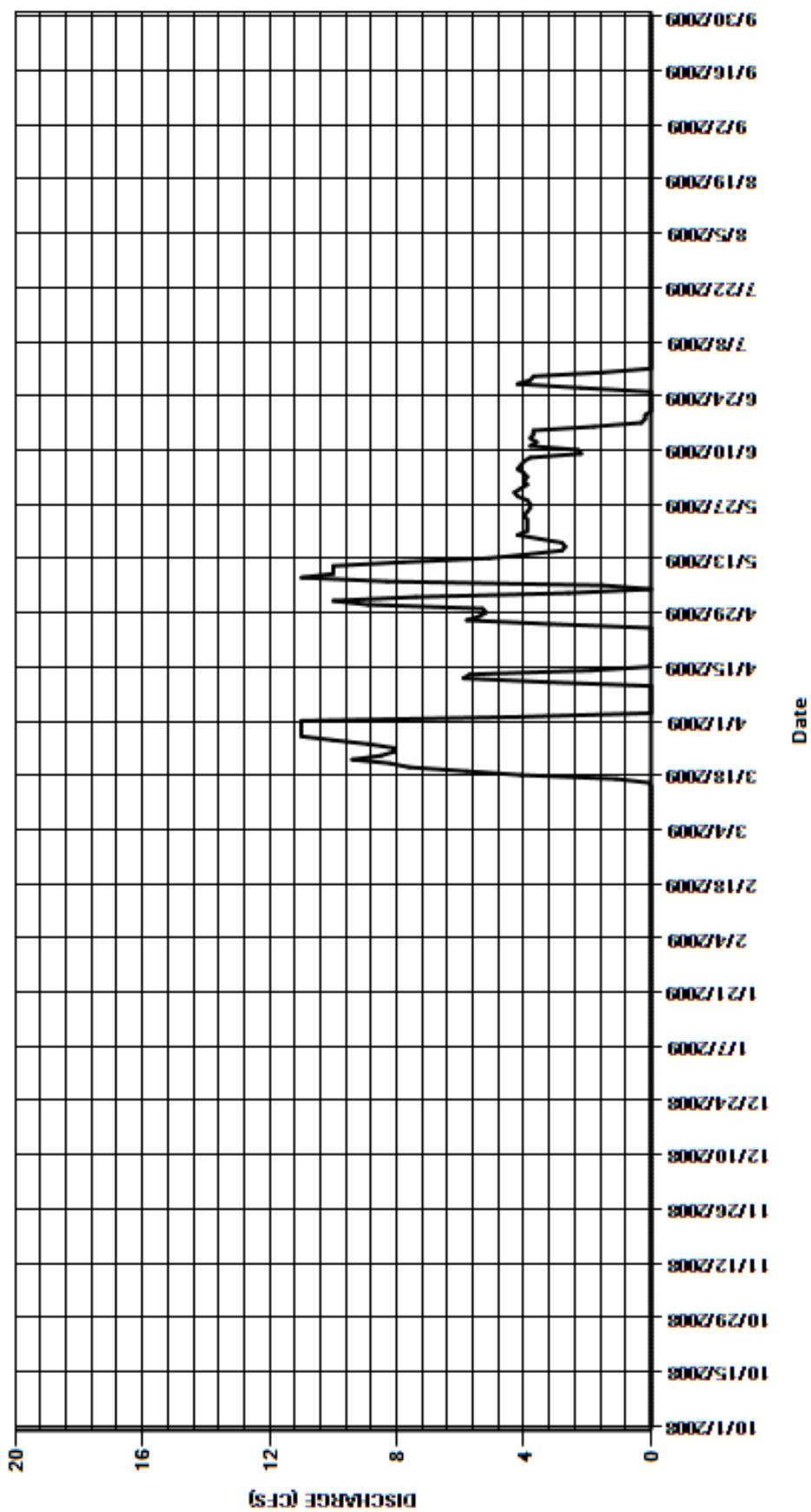
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	11	8.9	3.9	0	0	0
2	0	0	0	0	0	0	4.2	10	4	0	0	0
3	0	0	0	0	0	0	0	7.4	3.9	0	0	0
4	0	0	0	0	0	0	0	2.6	4	0	0	0
5	0	0	0	0	0	0	0	0	4.2	0	0	0
6	0	0	0	0	0	0	0	1.5	4.1	0	0	0
7	0	0	0	0	0	0	0	8.3	4	0	0	0
8	0	0	0	0	0	0	0	11	3.8	0	0	0
9	0	0	0	0	0	0	0	10	2.2	0	0	0
10	0	0	0	0	0	0	0	10	2.3	0	0	0
11	0	0	0	0	0	0	3.3	10	3.8	0	0	0
12	0	0	0	0	0	0	5.9	7.8	3.6	0	0	0
13	0	0	0	0	0	0	5.7	5.1	3.8	0	0	0
14	0	0	0	0	0	0	1.9	3.9	3.7	0	0	0
15	0	0	0	0	0	0	0	2.8	3.7	0	0	0
16	0	0	0	0	0	e0.04	0	2.7	1.8	0	0	0
17	0	0	0	0	0	e1.1	0	2.8	0.3	0	0	0
18	0	0	0	0	0	4.1	0	3.5	0.19	0	0	0
19	0	0	0	0	0	5.8	0	4.2	0.18	0	0	0
20	0	0	0	0	0	7.6	0	3.9	0	0	0	0
21	0	0	0	0	0	8.2	0	3.9	0	0	0	0
22	0	0	0	0	0	9.4	0	3.9	0	0	0	0
23	0	0	0	0	0	8.5	0	3.9	0	0	0	0
24	0	0	0	0	0	8.1	0	4	0	0	0	0
25	0	0	0	0	0	8.1	0	3.9	0	0	0	0
26	0	0	0	0	0	8.9	3.2	3.8	2.2	0	0	0
27	0	0	0	0	0	10	5.8	3.8	4.2	0	0	0
28	0	0	0	0	0	11	5.4	3.9	3.8	0	0	0
29	0	0	0	0	---	11	5.2	4.2	3.7	0	0	0
30	0	0	0	0	---	11	5.3	4.3	1.5	0	0	0
31	0	---	0	0	---	11	---	4.1	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	123.84	56.90	160.10	72.87	0.00	0.00	0.00
MEAN	0	0	0	0	0	3.99	1.9	5.16	2.43	0	0	0
AC-FT	0	0	0	0	0	246	113	318	145	0	0	0
MAX	0	0	0	0	0	11	11	11	4.2	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0
CAL YR	2008	TOTAL	330.47	MEAN	0.9	MAX	8.9	MIN	0	AC-FT	655	
WTR YR	2009	TOTAL	413.71	MEAN	1.13	MAX	11	MIN	0	AC-FT	821	

MAX DISCH: 13 CFS AT 20:15 ON May. 01,2009 GH 1.05 FT. SHIFT 0 FT.

MAX GH: 1.05 FT. AT 20:15 ON May. 01,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PINE RIDGE DITCH NEAR HESPERUS
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
09365500 LA PLATA RIVER AT HESPERUS
Water Year 2009

Location.--	Lat. 37°17'23", Long. 108°02'24", in NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, T.35 N., R.II W., NMPM La Plata County, Hydrologic Unit 14080105, on right bank at Hesperus 700 ft downstream from U.S. Highway 160.
Drainage and Period of Record.--	37 mi ² , approximately. Periodic data June 1904 to Nov. 1910. Continuous from June 1917 to current year, with some periods of monthly data only.
Equipment.--	Graphic water-stage recorder and a Sutron Satlink 2 HDR DCP with a shaft encoder on a separate float in a 64" x 64" concrete block shelter and a 42" diameter corrugated metal well. Primary reference gage is an electric tape in the well. The station is also equipped with a Sutron air temperature sensor and an electric float tank heater which is used to keep the well from freezing in the winter. Control is man-made concrete ramp flume located approximately 15 feet downstream. A steel foot bridge is located 60 feet below the gage house. Rip-rap and boulder weir were placed below the control on Mar. 16 and 17, 2009 to prevent scour below the control. No other changes this year.
Hydrographic Conditions.--	Drainage area above the gage is 37 square miles. The basin begins in high mountain terrain above 11,000 feet and drops to 8,100 feet at the gage from USGS topographic maps. The basin mainly consists of rock and forested mountains above the gage and changes to agricultural lands of moderate slope terrain below the gage. Small cobbles and gravel are deposited in the stilling pool above the control during low flow and scour during moderate to high flow events.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 30 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was reset on 4 separate occasions. All adjustments made were ± 0.01 feet. The record was corrected by prorating the correction by time to the last known matched reading. Three flush corrections were made this water year. The flush corrections occurred on Apr. 30, 2009 (+0.09 ft FC), May 18, 2009 (-0.06 ft FC) and Jun. 5, 2009 (-0.03 ft FC). The flush corrections were prorated by time within the final record back to the time and location of the inflection point on the hydrograph prior to the flush. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Dec. 5, 10-12, 15-17, 20, 21, 23-31, 2008; Jan. 1, 6-21, 27-31; Feb 1-5, 7, 9-15, 18-22, 28; Mar. 8, 11, 2009; and when the contractor placed rocks on the control to redirect water as a large boulder weir below the gage was installed: Mar. 16, 17, 2009. The large boulder weir was installed to prevent high water from undercutting the control. Rocks were removed from the control on Mar. 17, 2009.
Datum Corrections.--	Levels were run this water year on Sep. 22, 2009 using RM No. 1 as base. The gage was found to be reading -0.006 feet low. Levels were run again on Oct. 14, 2009 because Sept. 22 set of levels were outside the allowable closure limits by 0.001 feet. The Oct. 14, 2009 (closed within the allowable limits) levels found the gage to be reading -0.006 feet low. No corrections were made to gage heights of measurements or charts.
Rating.--	The control is a long throated flume, hereafter referred to as a "Ramp Flume" that was constructed in August of 2000 to act as the control section for the gage. The ramp flume is located about 15 feet below the inlets to the gage. A concrete ledge with an eight-inch "I" beam, located about 60 feet below the station, acts as a limit for scour but does not act as a control section. A large boulder weir was constructed on Mar. 16-17, 2009 between the "I" beam and control to further limit scour below the control. The boulder weir has no impact on the rating of the ramp flume. Flows are contained within a single channel up to a gage height of 5.8 feet. Flows above a gage height of 5.8 feet will overbank on the right side only. The left bank is contained by the small mesa that is over 15-feet above the flow line of the channel. Rating No. 37, in use since Dec. 25, 2004, was used until 1600 on Oct. 1, 2008. Rating No. 38 began on 1700 on Oct. 1, 2008 and was used for the remainder of water year 2009. The rating is well-defined to 560 cfs. Twenty discharge measurements (Nos. 1425-1444) were made this year, ranging in discharge from 5.43 to 176 cfs. They cover the range in stage experienced except for the lower daily flows of Aug. 20-23, 27-29, 31; Sep. 1, 2009 and the higher daily flow of May 1, 2, 6-20, 2009. The peak instantaneous flow at 0345 May 12, 2009 (382 cfs, GH = 4.79 ft, shift=0.00 ft) exceeded the stage of measurement No. 1435, made May 18, 2009 by 0.38 feet in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by stage with shift curve LAPHES08VSB from 0000 Oct. 1, 2008 until 1600 Oct. 1, 2008 to provide a smooth transition from water year 2008 to water year 2009. Rating No. 37 ended at 1600 on Oct. 1, 2008. The shift also changed during the transition from rating No. 37 (Sh=-0.01) to No. 38 (Sh=0.00). Oct. 1, 2008 is a variable shift day because of the shift change caused by the rating transition. Shifts as defined by measurements No. 1425 to 1430, were prorated by time from 1700 Oct. 1, 2009 (Sh=0.00) until 1300 on Mar. 20, 2009 (Sh=0.00). Shifts as defined by measurements No. 1430 to 1435, were distributed by stage with shift curve LAPHES09VSA from 1400 Mar. 20, 2009 until 1500 May 18, 2009 (end of high water). Shifts as defined by measurement No. 1435 to 1443 the receding limb of the hydrograph, were distributed by stage with shift curve LAPHES09VSB from 1600 May 18, 2009 until 1517 Sep. 4, 2009. Shifts as defined by measurement No. 1443 and 1444 were distributed by time from 1600 Sep. 4, 2009 until the end of water year. Open-water measurements showed shifts varying between -0.04 and +0.04 feet. Shifts were applied directly and given full weight except measurement Nos. 1429, 1430, 1432, 1433, 1435, 1436, 1439, 1440 and 1444 which were discounted from -8% to +7% to smooth shift distribution. Measurement No. 1434 was not used for shift distribution because of poor measurement conditions and electrical continuity problems with the meter and cable reel.
Special Computations.--	Three flush corrections occurred this water year. The corrections were prorated by time according to the Division of Water Resources (DWR) time proration method. The DWR time prorated method provides equal time to each unit change. Unit flush corrections were calculated and input by hand and applied to hourly data. Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records, partial days of good record and one discharge measurement No. 1428. The chart hydrograph was also used to estimate periods of ice-affected record by chopping the peaks caused by ice on the control.

Remarks--

Record good, except for Dec. 5, 10-12, 15-17, 20, 21, 23-31, 2008; Jan. 1, 6-21, 27-31; Feb 1-5, 7, 9-15, 18-22, 28; Mar. 8, 11, 2009 when ice on the control affected the stage-discharge relationship and Mar. 16, 17, 2009 when the contractor placed rocks on the control to divert water as they placed the boulder weir below the control. The contractor removed the rocks on Mar. 17, 2009 after the project was complete. Record during periods of ice and boulder weir construction should be considered poor. Station maintained and record developed by Brian Boughton

Recommendations--

Currently, the top of the sill of the shelter door is at a gage height of 5.80-ft. Although high flow events above a gage height of 5.80-ft are rare, they occur, and may warrant the installation of a crest gage. The large boulder weir that was installed on Mar. 16-17 stabilized the control but made the high water measurement section poor. A bank operated cableway may need to be installed in the weir pool above the gage to provide more reliable high water measurements.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09365500 LA PLATA RIVER AT HESPERUS

RATING TABLE--

LAPHESCO37 USED FROM 01-Oct-2008 TO 01-Oct-2008
LAPHESCO38 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.7	7.9	7	e6	e6.2	8.6	18	208	67	26	9.6	5.2
2	7.6	7.7	7	6.1	e6.2	8.9	24	224	57	29	9.2	5.7
3	7.6	7.7	6.7	6.2	e6.5	9.2	27	168	60	25	8.7	5.8
4	8.9	7.7	6.7	6.2	e6.5	9.6	28	126	61	21	8.2	5.9
5	9.2	8	e6.3	6.1	e6.5	10	26	132	56	20	7.9	6.1
6	8.2	7.6	6.3	e6	7	9.8	26	178	48	22	7.9	7.2
7	8	7.3	6.3	e6	e7	9.8	25	246	42	17	7.8	6.3
8	8	7.3	6.5	e6	7.1	e9.5	25	312	38	15	7.4	6.2
9	8.4	7.3	6.3	e6	e7	10	30	316	32	15	7.1	6.5
10	8.6	7.6	e6.3	e6	e7	11	39	325	31	15	6.7	7.2
11	9.5	7.3	e6.3	e6	e7	e11	43	340	24	14	6.5	7.6
12	9.4	7.3	e6.3	e5.9	e7.2	12	39	345	21	17	6.2	7.9
13	9.7	7.3	6.3	e5.9	e7.2	13	39	322	22	20	6.2	8.1
14	9.6	7.1	6.5	e5.9	e7.2	12	45	292	23	19	7.3	8.2
15	9.3	7	e6.3	e5.9	e7.2	13	44	265	22	18	6.6	8.2
16	9.4	7	e6.3	e5.9	7.7	e13	41	242	25	17	6	9
17	8.6	6.9	e6.3	e5.9	7.7	e14	38	220	27	16	5.8	9.1
18	8.5	6.9	6.6	e5.9	e7.7	14	35	225	27	15	5.6	8.7
19	8.5	6.9	6.3	e5.9	e7.7	13	35	224	27	14	5.8	8.7
20	8.5	6.7	e6.3	e5.9	e7.7	13	44	186	28	13	5	8.7
21	8.5	6.7	e6.3	e5.9	e7.7	16	72	150	24	13	5.1	8.9
22	8.5	6.7	6.4	5.9	e7.7	44	98	164	23	13	5	9.3
23	8.5	6.7	e6.3	6.5	7.9	51	117	149	25	14	5.2	10
24	8.4	6.7	e6.2	6.9	8.3	41	124	168	27	14	6.2	11
25	8.4	6.7	e6.2	6.7	8.3	35	136	151	29	13	6.3	11
26	8.3	6.7	e6	6.7	8.3	30	127	118	50	13	5.8	11
27	8.2	7.4	e6	e6	8.3	24	108	98	40	12	5.4	10
28	8.1	7.2	e6	e6	e8.3	22	121	80	31	12	5.3	10
29	8	7	e6	e6	---	22	129	74	28	11	5.2	10
30	7.9	7	e6	e6	---	21	167	71	26	11	5.6	10
31	7.8	---	e6	e6	---	19	---	69	---	11	5.3	---
TOTAL	263.8	215.3	196.3	188.3	206.1	549.4	1870	6188	1041	505	201.9	247.5
MEAN	8.51	7.18	6.33	6.07	7.36	17.7	62.3	200	34.7	16.3	6.51	8.25
AC-FT	523	427	389	373	409	1090	3710	12270	2060	1000	400	491
MAX	9.7	8	7	6.9	8.3	51	167	345	67	29	9.6	11
MIN	7.6	6.7	6	5.9	6.2	8.6	18	69	21	11	5	5.2

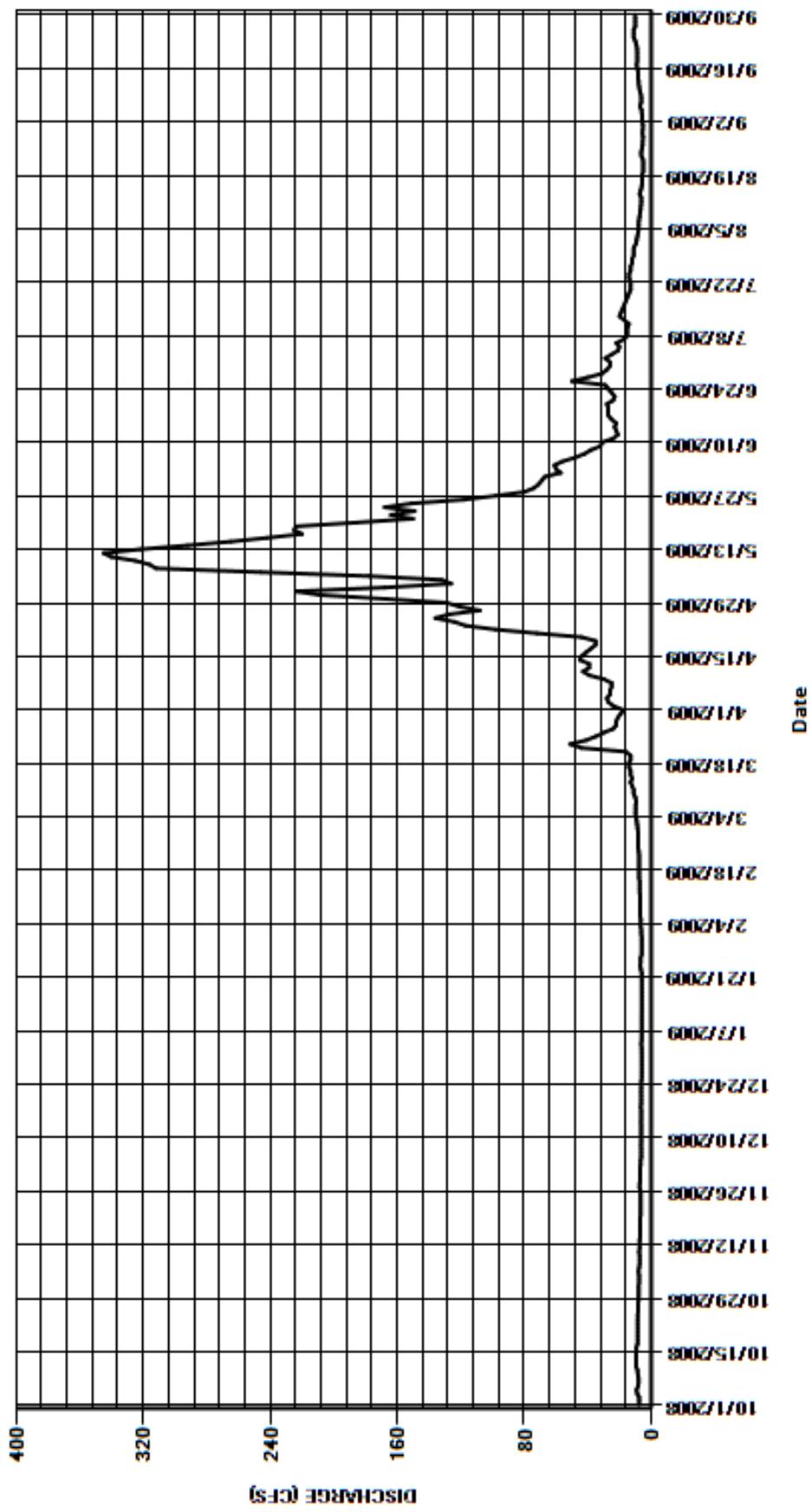
CAL YR	2008	TOTAL	16141.0	MEAN	44.1	MAX	366	MIN	5	AC-FT	32020
WTR YR	2009	TOTAL	11672.6	MEAN	32	MAX	345	MIN	5	AC-FT	23150

MAX DISCH: 382 CFS AT 03:45 ON May. 12,2009 GH 4.79 FT. SHIFT 0 FT.

MAX GH: 4.79 FT. AT 03:45 ON May. 12,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09365500 LA PLATA RIVER AT HESPERUS
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
CHERRY CREEK AT THE MOUTH NEAR RED MESA
Water Year 2009

Location.--	Lat. 37°07'03", Long. 108°11'53", in NW¼SW¼ sec. 7, T.33 N., R.12 W., NMPM, La Plata County
Drainage and Period of Record.--	66 mi ² .
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 42" corrugated metal well in a concrete block shelter. The primary reference gage is a steel drop tape referenced to a reference point (RP) on the wooden instrument shelf. No other changes.
Hydrographic Conditions.--	The channel bottom is composed of cobble and gravel. Starting late spring moss builds in the channel bottom. At higher flows the dense tamarisk growth along the banks and high flows on the La Plata River impact the stage discharge relationship. Flows in the stream are intermittent and depend on irrigation above the gage, snow pack and monsoon rains.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 13 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted to match the reference on 2 separate occasions. All adjustments made were ±0.02 feet. Shaft encoder corrections were prorated by time back to the last site visit when the readings matched. The record is complete and reliable, except for the following days when the stage-discharge relationship was affected by ice: Dec. 9-19, 2008; Feb. 6-28; Mar. 1, 2009 ; the floats were frozen in the well: Dec. 20-31, 2008; Jan. 1-31; Feb. 1-5, 2009 ; and the control was impacted by trash and leaf debris: Apr. 21-30; May 1-8, 2009 .
Datum Corrections.--	Levels have never been run at this gage. No levels were run this year.
Rating.--	The control is an natural cobble riffle located below the station. Dense tamarisk growth and high flows on the La Plata River control at high flow. The cobble riffle is the control at the low to medium flows. Moss, tamarisk growth, sand, silt fill and scour in the channel causing shifts. Rating No. 3A, dated Oct. 1, 2006, was used the entire water year. It is fairly well defined from 2.4 to 107 cfs. Six measurements (Nos. 76-81) were made during the current water year ranging in discharge from 0.17 to 36.9 cfs. Observations of zero flow cover the lower range of stage experienced. Observations of zero flow were made on October 10, 2008 and August 6, 2009. The measurements cover the higher range in stage experienced except for the higher average daily flows of Apr. 22-23; May 3, 2009. The peak flow of 63.4 cfs, which occurred at 0945 on May 3, 2009, at a gage height of 2.60 ft. and shift of -0.06 ft, exceeded the measurement made June 26, 2009 by 0.36 ft in stage. The peak gage height occurred at 1130 on March 1, 2009 at a gage height of 2.62 ft was caused by backwater from ice on the control.
Discharge.--	Shifting control method was used for the entire water year. Shifts were affected by trash, leaf debris, tamarisk growth and the movement of sediment. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were prorated by time from Oct. 1, 2008 – May 8, 2009 ; and from Aug. 6, 2009 – Sep. 30, 2009. Shifts were distributed by stage as defined by Meas. No.'s 79 to 81for the period May 8, 2009 – Aug. 6, 2009 . Open-water measurements showed shifts varying between -0.20 and +0.04 feet. Shifts were applied directly and given full weight except Measurement No. 80 which was discounted 6% to smooth shift distribution. The trash on the control was not observed directly during measurement No. 78 (prevented by muddy flow) but the negative shift indicates it was present. Trash was observed at the subsequent measurement No. 79 but seemed to have less impact at the lower stage.
Special Computations.--	Discharge for periods of ice affected record and no valid gage height record were estimated on the basis of partial day record, air temperature records at the La Plata River at Colo/New Mexico Stateline and the administrative gage on the La Plata River below Cherry Creek (LAPCHECO). LAPCHECO is located approximately 1,200 ft. downstream of the Cherry Creek gage. A hydrograph was used. A partial record of the administrative gage on the La Plata River below Cherry Creek was developed and compared to the flows at the Cherry Creek gage. The control on the La Plata River gage is a concrete ramp flume installed in 2002. It is located approximately 1,200 ft. below the confluence of Cherry Creek and the La Plata River. The LaPlata River below Cherry Creek provides a stable control that has minimal impact from ice during the winter months. The record was developed for period January through May, 2009. The winter flows on the LaPlata River (non-ice affected record) were used to estimate flows at the Cherry Creek gage for the same period. A mass balance approach was used to validate and estimate the flows from March 1 to May 11, 2009. Administrative record at the LaPlata River near Breen, water commissioner record on 3 ditches (Freed, Revival and Vosburg) and partial record at the LaPlata River below Cherry Creek were used to develop the estimated flow at the Cherry Creek gage. The time shift from Breen to LaPlata below Cherry Creek gage was neglected but appears to be a valid assumption during the winter and early spring when base flows remain constant. As the base flows increase and irrigation begins there was a larger variation when comparing the mass balance record to the stage-shift-discharge record. Measurement No. 77 was made indirectly by measuring at the LaPlata River below Cherry Creek gage and the LaPlata River above the confluence of Cherry Creek. Taking the difference between the two readings yielded the estimated flow on Cherry Creek.
Remarks.--	Record is excellent from October 1, 2008 to November 28, 2008 and July 26 to September 30, 2009. Record is fair the remainder of the year, except for days on which ice on the control, the floats were frozen in the well and trash and debris affected the stage-discharge relationship. Record during this period should be considered poor. The instantaneous peak flow should be considered poor as well. Station maintained and record developed by Brian Boughton.

Recommendations.--

Levels and benchmarks should be established in Water Year 2010. More measurements need to be made at key times in order to better define the changes in the control throughout the water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CHERRY CREEK AT THE MOUTH NEAR RED MESA

RATING TABLE--

CHEREDCO03A USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

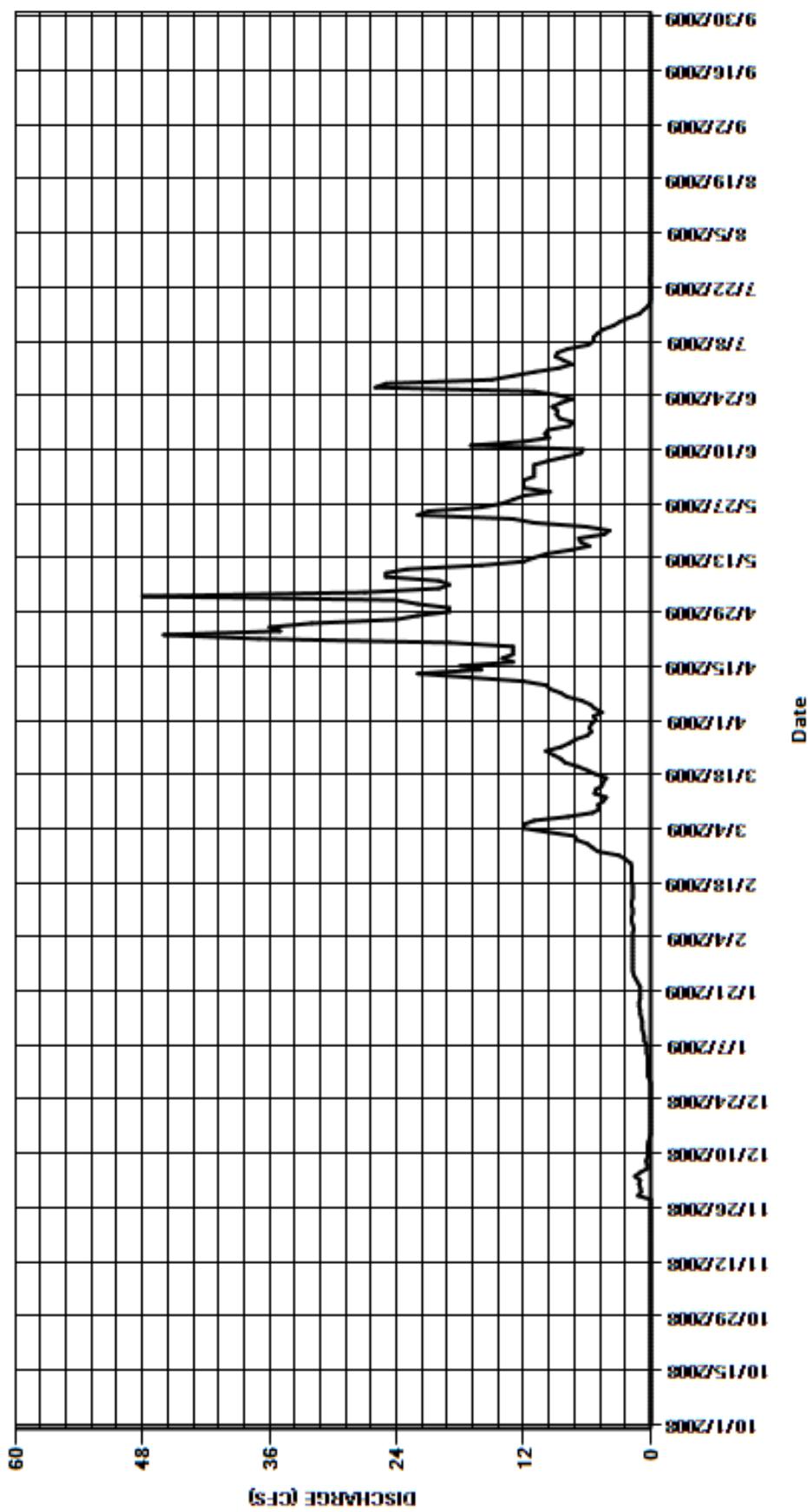
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0.98	e0.3	e1.7	e7	5.2	e22	12	8.7	0	0
2	0	0	1.1	e0.3	e1.7	7.2	5.4	e24	12	7.4	0	0
3	0	0	1	e0.3	e1.7	9.7	4.6	e48	11	8.2	0	0
4	0	0	1.5	e0.3	e1.7	12	5.3	e27	11	9	0	0
5	0	0	1	e0.4	e1.7	12	5.7	e20	11	8.8	0	0
6	0	0	0.32	e0.4	e1.6	11	6.5	e19	11	7.8	0	0
7	0	0	0.34	e0.4	e1.7	7.8	7.9	e20	9.7	5.9	0	0
8	0	0	0.45	e0.6	e1.8	5.5	8.5	e25	8.1	5.4	0	0
9	0	0	e0.3	e0.6	e1.8	4.8	9.5	25	6.6	5.4	0	0
10	0	0	e0.3	e0.7	e1.7	5	9.9	23	6.4	5	0	0
11	0	0	e0.3	e0.8	e1.7	4.5	12	16	17	4.5	0	0
12	0	0	e0.3	e0.8	e1.8	4.2	17	12	12	3.5	0	0
13	0	0	e0.2	e0.8	e1.8	5.3	22	11	9.6	2.9	0	0
14	0	0	e0.1	e0.9	e1.7	5.2	16	9.8	10	2.1	0	0
15	0	0	e0	e1	e1.7	4.6	18	7.5	9.7	1.1	0	0
16	0	0	e0	e1	e1.7	4.5	13	5.8	7.7	0.7	0	0
17	0	0	e0	e1.1	e1.7	4.2	14	6.6	7.3	0.27	0	0
18	0	0	e0	e1.1	e1.8	5.2	13	6.8	8.6	0.05	0	0
19	0	0	e0	e1	e1.8	6	13	4.4	8.9	0.01	0	0
20	0	0	e0	e1	e1.8	6.9	13	3.9	8.8	0	0	0
21	0	0	e0	e1	e1.8	8.1	e19	6.1	9.3	0	0	0
22	0	0	e0	e1	e1.8	8.5	e37	11	8.5	0	0	0
23	0	0	e0	e1.2	e1.9	9.2	e46	13	7.4	0.03	0	0
24	0	0	e0	e1.4	e2.4	9.9	e35	22	8.8	0.06	0	0
25	0	0	e0	e1.6	e3	8.5	e36	21	11	0.02	0	0
26	0	0	e0	e1.7	e5	7.7	e32	16	26	0	0	0
27	0	0	e0	e1.7	e5.5	7.1	e24	14	25	0	0	0
28	0	0	e0	e1.7	e6	6	e22	13	15	0	0	0
29	0	1.2	e0.1	e1.7	---	5.6	e19	12	13	0	0	0
30	0	0.9	e0.3	e1.7	---	5.8	e19	9.5	11	0	0	0
31	0	---	e0.3	e1.7	---	5.6	---	12	---	0	0	---
TOTAL	0.00	2.10	8.89	30.20	62.0	214.6	508.5	486.4	333.4	86.84	0.00	0.00
MEAN	0	0.07	0.29	0.97	2.21	6.92	16.9	15.7	11.1	2.8	0	0
AC-FT	0	4.2	18	60	123	426	1010	965	661	172	0	0
MAX	0	1.2	1.5	1.7	6	12	46	48	26	9	0	0
MIN	0	0	0	0.3	1.6	4.2	4.6	3.9	6.4	0	0	0
CAL YR	2008	TOTAL	2905.77	MEAN	7.94	MAX	80	MIN	0	AC-FT	5760	
WTR YR	2009	TOTAL	1732.93	MEAN	4.75	MAX	48	MIN	0	AC-FT	3440	

MAX DISCH: 63 CFS AT 09:45 ON May. 03,2009 GH 2.6 FT. SHIFT -0.06 FT.

MAX GH: 2.62 FT. AT 11:30 ON Mar. 01,2009 (BACKWATER FROM ICE ON CONTROL)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CHERRY CREEK AT THE MOUTH NEAR RED MESA
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
LONG HOLLOW AT THE MOUTH NEAR RED MESA
Water Year 2009

Location.--	Lat. 37°03'02", Long. 108°10'23", in SE ¼ SW ¼ sec. 32, T.33 N., R.12 W., NMPM, La Plata County.
Drainage and Period of Record.--	46.5 mi ² . October 1988 to present.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 satellite monitoring DCP and shaft encoder on separate floats in a wooden shelter and well at a 4-foot steel Parshall flume. Primary reference gage is outside staff gage installed in flume. No other changes.
Hydrographic Conditions.--	The creek above and below the control is silt. The approach conditions into the flume are fair. The creek base flow is from irrigation return flows and will flash during rain events or heavy snow melt.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 11 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was not adjusted this water year. Moss was removed from the control and resulted in a -0.01 ft corrections on June 18, 2009 and August 24, 2009. Record from the DCP is complete and reliable, except for the period when ice on the control affected the stage discharge relationship (Dec. 27-31, 2008).
Datum Corrections.--	Levels were run on March 2, 2009 using the floor of the flume at the staff gage as a base. Levels were used to establish the level of the flume. No other benchmarks were established. The results of the levels show the flume is high at the staff gage and low at the intake. The results substantiate the reason for positive shifts.
Rating.--	The control is a 4-foot Parshall flume installed in 1988 to monitor the return flows through Long Hollow for the Animas/La Plata Conservancy District. Horizontal dirt and grass wing walls extend in both directions above an elevation of 2.25 feet. The PZF of the gage is approximately -0.06 ft. Rating No. 1A, in use since October 1, 2007, is a standard 4- foot Parshall flume rating from gage height 0 to 2.25. At gage heights above 2.25 ft. flow occurs in the natural channel. Rating 1A was used the entire year. It is well defined from 1.44 to 29 cfs. Three measurements were made during the current water year ranging in discharge from 2.09 to 4.71 cfs. They cover the range in stage experienced except for the lower average daily flows of Jul. 16-22, 25; Aug. 2-14, 16-24, 30, 2009 and the higher average daily flow of Nov. 10-14, 17-30; Dec. 1-28, 30, 31, 2008; Jan. 1-31; Feb. 1-28; Mar. 1-31, Apr. 1-30; May 1-16, 22-27, 2009. The peak instantaneous flow at 1245 Feb. 11, 2009, (9.53 cfs, GH = 0.69 ft, shift= +0.03 ft) exceeded the stage of measurement No. 208, made Nov. 25, 2008 by 0.25 ft. in stage. The peak instantaneous gage height of 0.82 ft at 0830 Dec. 29, 2008 was caused by backwater from ice on the control.
Discharge.--	Shifting control method was used during the entire water year. The main reason of shifting is caused by the unlevel Parshall flume. Shifting can also be caused by moss growth in the flume and erosion and deposition of silt in the approach section of the flume. Measurements show unadjusted shifts varying from +0.02 to +0.04 feet. Shifts were applied directly and given full weight except for measurement No. 208 and 210 which were discounted +3% and -3% respectively to smooth shift distribution. Shifts were distributed by stage using variable shift table LONREDCOVS08A from 0000 Oct. 1, 2008 to 2355 Oct. 31, 2008. Oct. 31 was chosen as it marks the end of the irrigation year. It ends the transition from water year 2008 to 2009. Shifts were distributed by time from 0000 Nov. 1, 2008 until 1544 Nov. 25, 2008 (meas. no. 208). Variable shift LONREDCOVS09A was used from 1600 Nov. 25, 2008 until the end of the water year.
Special Computations.--	Discharge for periods of ice affected record were estimated on the basis of good gage data before and after ice affected data, partial days of good record, air temperature records from the La Plata River at Colorado/New Mexico Stateline gage and a comparison with the combined flow at the La Plata River at the Colorado/New Mexico Stateline gage, Enterprise Ditch, Pioneer Ditch and Sooner Valley Ditch. A hydrograph was used.
Remarks.--	Record is good except for the days when ice formed on the control. Periods of ice affected record should be considered poor. Station maintained and record developed by Brian Boughton.
Recommendations.--	A new rating, LONREDCO02, has been developed for the gage but is still in the preliminary stages. Additional high flow measurements are desired before it is implemented. With the abundance snow within the basin, several high flow measurements should be obtained in the spring of water year 2010.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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LONG HOLLOW AT THE MOUTH NEAR RED MESA

RATING TABLE--

LONREDCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3	4.2	5.2	5.8	5.9	6	5.3	4.8	4.4	2.8	2.1	2.1
2	3	4.3	5.3	5.9	5.7	6	5.3	5.9	4.4	2.7	2	2.1
3	3.1	4.4	5.3	6	5.8	5.6	5.2	7.1	4.2	2.8	2	2.2
4	3.5	4.4	5.2	6.1	6	5.7	5.7	6.4	4.1	2.7	2	2.3
5	4.1	4.5	5.2	6.2	6	5.7	5.8	5.4	4	2.9	1.9	2.3
6	3.8	4.5	5.3	6	6.1	5.7	5.5	5.3	3.9	2.7	1.9	2.4
7	3.7	4.4	5.3	5.9	6	5.8	5.3	5.7	3.8	2.7	1.8	2.3
8	3.7	4.6	5.5	5.9	6.1	5.7	5.2	6.7	3.7	2.5	1.7	2.3
9	3.6	4.6	5.6	5.6	6.4	5.7	5.2	6.5	3.7	2.4	1.8	2.2
10	3.6	5	5.3	5.5	6.4	5.6	5.1	6	4.2	2.3	1.8	2.3
11	3.6	5	5.2	5.2	5.8	5.5	6.3	5.5	4.3	2.3	1.7	2.3
12	3.7	4.9	5.3	5.4	6	5.5	6.8	5.8	4	2.3	1.6	2.2
13	3.8	4.8	5.5	5.5	6.3	5.6	5.8	5.8	3.8	2.2	1.6	2.3
14	3.8	4.8	5.3	5.6	6.2	5.8	5.5	5.2	3.8	2.2	2	2.4
15	3.8	4.7	4.9	5.5	5.7	5.7	5.5	5.2	3.6	2.1	2.1	2.5
16	3.9	4.7	5.4	5.5	6.1	5.4	5.4	4.9	3.5	2	1.9	2.7
17	3.9	4.8	5.7	5.6	6	5.4	5.6	4.3	3.5	1.9	1.9	2.7
18	3.9	4.8	5.9	5.5	6	5.3	6	4.1	3.4	1.9	1.8	2.8
19	3.9	4.9	5.7	5.6	6	5.4	5.7	4	3.2	1.8	1.8	2.8
20	4	4.9	5.1	5.8	6	5.3	5.5	4.2	3.3	1.9	1.7	2.7
21	4	4.9	5.4	5.8	6.1	5.4	5.3	4.4	3.3	1.9	1.7	2.7
22	3.9	4.9	5.7	6.1	6.1	5.3	5.1	5.5	3.2	2	1.7	2.7
23	4	4.9	6	6.4	6.3	5.4	4.9	5.6	3	2.2	1.7	2.8
24	4.1	4.8	5.5	6.8	6.5	5.5	5.1	6.1	2.9	2.1	2	2.8
25	4.1	4.8	5.8	7.1	6.4	5.4	5.1	5.6	3.1	2	2.1	2.8
26	4.1	4.9	6.1	6.7	6.4	5.4	5.3	5.1	3.6	2.1	2.3	2.8
27	4.1	5.5	e5.2	6.5	6.4	5.5	5.6	4.8	3.5	2.1	2.1	2.8
28	4.1	6.4	e4.7	5.9	6.1	5.4	5.4	4.7	3.3	2.2	2.1	2.8
29	4.1	5.6	e4.5	5.8	---	5.3	5.1	4.6	3.2	2.2	2.1	2.8
30	4.1	5.2	e5	5.6	---	5.2	4.9	4.7	3	2.2	2	2.8
31	4.1	---	e5.5	5.8	---	5.2	---	4.6	---	2.2	2.1	---
TOTAL	118.1	145.1	166.6	182.6	170.8	171.4	163.5	164.5	108.9	70.3	59.0	75.7
MEAN	3.81	4.84	5.37	5.89	6.1	5.53	5.45	5.31	3.63	2.27	1.9	2.52
AC-FT	234	288	330	362	339	340	324	326	216	139	117	150
MAX	4.1	6.4	6.1	7.1	6.5	6	6.8	7.1	4.4	2.9	2.3	2.8
MIN	3	4.2	4.5	5.2	5.7	5.2	4.9	4	2.9	1.8	1.6	2.1

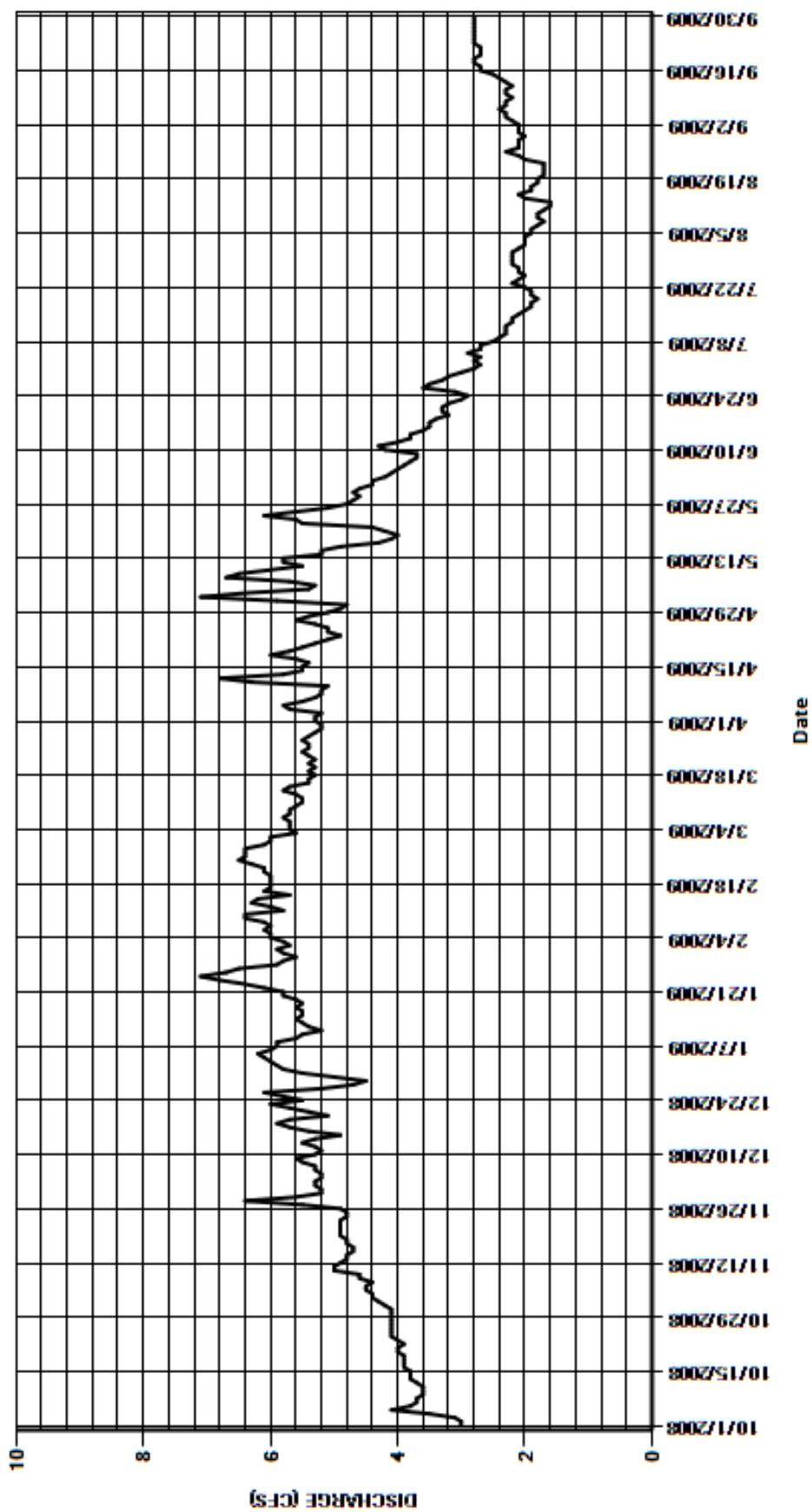
CAL YR	2008	TOTAL	1969.5	MEAN	5.38	MAX	30	MIN	2	AC-FT	3910
WTR YR	2009	TOTAL	1596.5	MEAN	4.37	MAX	7.1	MIN	1.6	AC-FT	3170

MAX DISCH: 9.5 CFS AT 12:45 ON Feb. 11,2009 GH 0.69 FT. SHIFT 0.03 FT.

MAX GH: 0.82 FT. AT 08:30 ON Dec. 29,2008 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LONGHOLLOWATTHEMOUTHNEARREDMESA
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
Water Year 2009

Location.-- Lat. 36°59'58", Long. 108°11'09", in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T.32 N., R.13 W., NMPM, La Plata County.

Drainage and Period of Record.-- N/A

Equipment.-- A Sutron high data rate Satlink 2 DCP with a shaft encoder in a 30-inch diameter corrugated metal pipe shelter and a 20-inch X 20-inch concrete well. Primary reference gage is outside staff gage (0 to 1.06-ft) installed in flume. Control is a 1-foot concrete Parshall flume. No changes this year.

Hydrographic Conditions.-- Heavy vegetation growth upstream and downstream will cause changes in shifts from year to year. A head gate to the first ditch lateral is located approximately 25-ft below the flume. On occasion the vegetation growth downstream and operations at the head gate can submerge the Parshall flume.

Gage-Height Record.-- The primary record is hourly averages of 15 minute DCP log data with satellite data used for backup purposes. Record is complete and reliable, except for periods when a large rain event dumped silt and debris in the ditch causing the flume to submerge: September 19-25, 30, 2009; periods when ice in the stilling well caused the float to heave: December 20, 2008; January 18-23, 2009, and when the float was beached on mud in the well: Oct. 1, 2008.

Datum Corrections.-- Levels have never been run at this gage.

Rating.-- The control is a standard, 1-foot, concrete Parshall flume. Rating No. 01 is a standard 1-ft Parshall flume rating above a gage height of 0.12-ft. The intake to the stilling well is 0.12-ft above the floor of the flume. Flows below a gage height 0.12-ft are assumed to be negligible and a 0 flow is assigned to them. Rating No. 01 has been used since the gage was installed and was used all water year. No discharge measurements were made this water year. Two observations of zero flow were made on Oct. 1 and 27, 2009. The peak instantaneous flow occurred at 1315 May 18, 2009 (5.76 cfs, GH = 1.27 ft, shift= 0.00 ft) and the peak instantaneous gage height of 2.08 ft occurred at 1330 on Sept. 19, 2009 caused by a submerged flume.

Discharge.-- Measurements are made at the staff gage in the flume and well intake. No discharge measurements were made this water year. A zero shift was applied for the entire water year.

Special Computations.-- A 60% correction factor was applied during the period when the flume was submerged (Sept. 19-22, 30, 2009). Almost any correction factor can be applied when a flume is 100% submerged. For the purposes of this analysis 60% correction was assumed adequate. During the period Sept. 23-25, 2009 it was assumed the ditch was clogged downstream of the flume and the gage height recorded at the station was standing water in the ditch (i.e. zero flow).

Remarks.-- Record fair, except for the period September 19-25, 30, 2009 when the flume was submerged. Record during this period should be considered poor. Station maintained and record developed by Brian Boughton.

Recommendations.-- Currently the bottom of the well is level with the bottom of the intake. Mud and silt can build up enough and not allow the float to settle to the bottom. The existing stilling well should be removed and a deeper one installed or the bottom of the existing well should be removed and excavated deeper.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE--

PIODITCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	1.9	3.2	3.1	1.8	0
2	0	0	0	0	0	0	0	2	3.2	3.1	1.6	0
3	0	0	0	0	0	0	0	1.9	3.1	3.1	1.1	0
4	0	0	0	0	0	0	0	2.4	3	3.1	0.8	0
5	0	0	0	0	0	0	0	4.1	3	3.1	0.63	0
6	0	0	0	0	0	0	0	3.8	3	3.1	0.6	0
7	0	0	0	0	0	0	0	4	3	3	0.57	0
8	0	0	0	0	0	0	0	4.2	3.1	2.5	0.52	0.09
9	0	0	0	0	0	0	0	4.5	3	2.3	0.64	0.05
10	0	0	0	0	0	0	0	4.5	2.9	2	0.87	0
11	0	0	0	0	0	0	0	4.3	2.9	2	0.59	0
12	0	0	0	0	0	0	0	4.2	2.8	1.7	0.39	0
13	0	0	0	0	0	0	0	4.2	2.7	1.1	0.25	0
14	0	0	0	0	0	0	0	4.2	2.7	1.1	0.19	0
15	0	0	0	0	0	0	0	4.2	2.6	1.2	0.18	0
16	0	0	0	0	0	0	0	4.6	2.7	1	0	0
17	0	0	0	0	0	0	0	5.3	3.3	0.93	0	0
18	0	0	0	0	0	0	0	5.5	3.3	1.5	0	0
19	0	0	0	0	0	0	0	5.2	3.3	2.2	0	e0.7
20	0	0	0	0	0	0	0	5	3.4	2.1	0	e0.1
21	0	0	0	0	0	0	0	3.9	3.4	2	0	e0.1
22	0	0	0	0	0	0	0	4	3.4	2.1	0	e0.1
23	0	0	0	0	0	0	0	4	3.4	2.1	0	e0
24	0	0	0	0	0	0	0	4.1	3.3	2.1	0.03	e0
25	0	0	0	0	0	0	0	4.1	3.4	2	0.24	e0
26	0	0	0	0	0	0	0.73	4	3.4	2	0.24	0
27	0	0	0	0	0	0	2.1	3.9	3.3	2	0.19	0
28	0	0	0	0	0	0	2.1	4	3.3	1.9	0.18	0
29	0	0	0	0	---	0	1.9	3.9	3.3	1.9	0.07	0
30	0	0	0	0	---	0	1.9	3.9	3.2	1.9	0	e0.05
31	0	---	0	0	---	0	---	3.7	---	1.9	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	8.73	123.5	93.6	65.13	11.68	1.19
MEAN	0	0	0	0	0	0	0.29	3.98	3.12	2.1	0.38	0.04
AC-FT	0	0	0	0	0	0	17	245	186	129	23	2.4
MAX	0	0	0	0	0	0	2.1	5.5	3.4	3.1	1.8	0.7
MIN	0	0	0	0	0	0	0	1.9	2.6	0.93	0	0

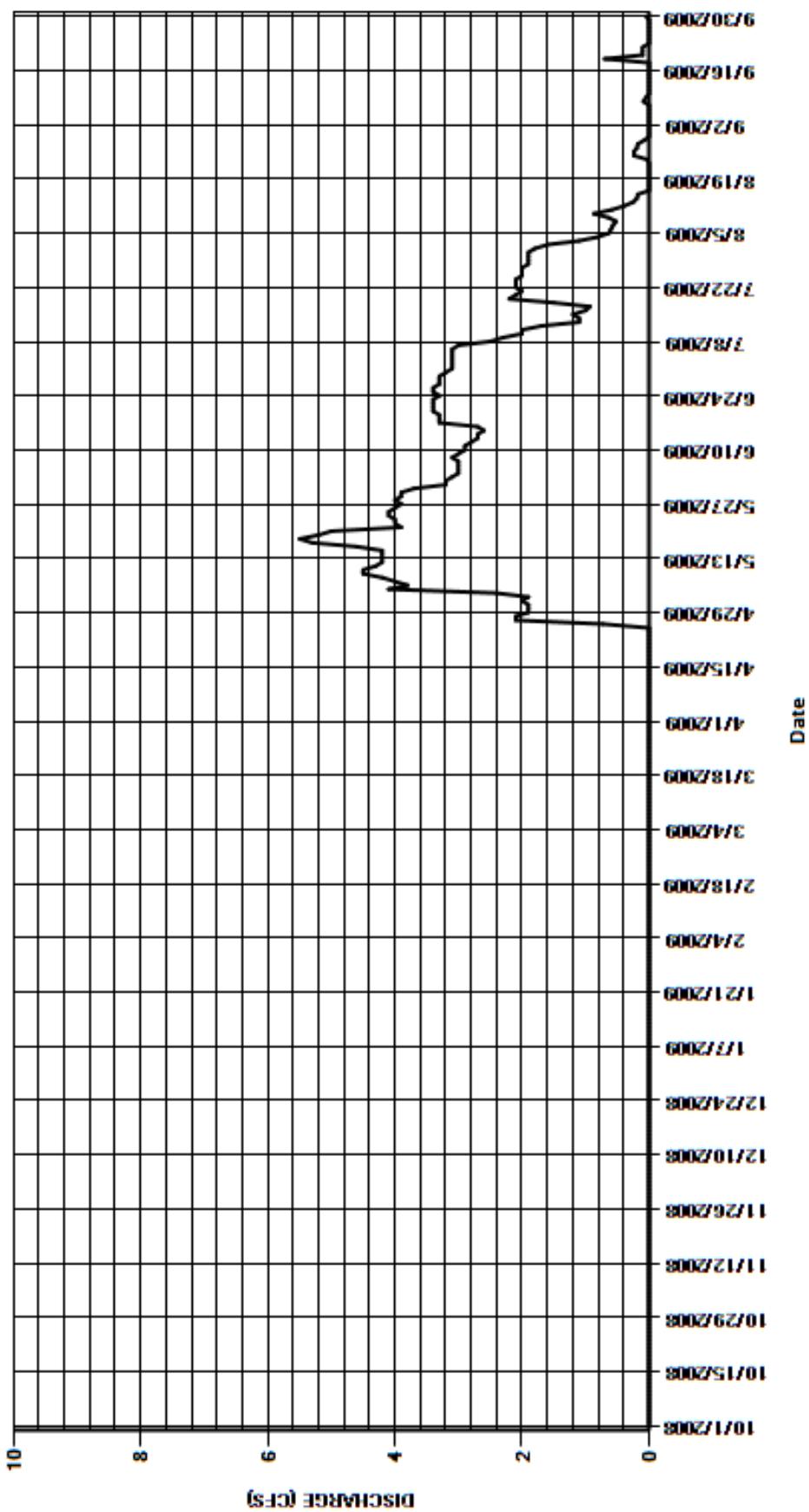
CAL YR	2008	TOTAL	332.23	MEAN	0.91	MAX	3.2	MIN	0	AC-FT	659
WTR YR	2009	TOTAL	303.83	MEAN	0.83	MAX	5.5	MIN	0	AC-FT	603

MAX DISCH: 5.8 CFS AT 13:15 ON May. 18,2009 GH 1.27 FT. SHIFT 0 FT.

MAX GH: 2.08 FT. AT 13:30 ON Sep. 19,2009 (flume submerged)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE
Water Year 2009

Location.-- Lat. 37°00'50", Long. 108°11'18", in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, T.32 N., R.13 W., NMPM, La Plata County.

Drainage and Period of Record.-- N/A

Equipment.-- A Sutron Satlink 2 high data rate DCP with a shaft encoder in a 30-inch diameter corrugated metal pipe shelter and well. Primary reference gage is outside staff gage installed in flume. Control is a 2-foot concrete Parshall flume. No other changes this year.

Hydrographic Conditions.-- The ditch above and below the control is silt with a very well defined stilling pool. The approach conditions into the flume are good. Vegetative growth downstream of the flume can cause submergence if the ditch is not maintained.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data with no backup data. The gage was visited on 9 separate occasions. The primary record was adjusted twice this water year. Shaft encoder corrections were made on June 3, 2009 (-0.01 ft) and September 10, 2009 (+0.02 ft). Record is complete and reliable except for the following periods when ice in the stilling well caused the float to heave: Dec. 31, 2008, Jan. 1-31; Feb. 1-5, 2009; and the intake was plugged with mud: Aug. 10-31; Sep. 1-10, 2009.

Datum Corrections.-- Levels were run this water year on Mar. 2, 2009 using the floor of the flume at the staff gage as the base. Levels were used to determine if the converging section of the flume is level. Results indicate the flume was properly set. No other benchmarks were set at the time.

Rating.-- The control is a 2 foot concrete Parshall flume. Rating No. 01, a standard 2-ft Parshall flume rating above a gage height of 0.03-ft, was used the entire water year. The intake to the stilling well is 0.03-ft above the floor of the flume. Flows below a gage height 0.03-ft are assumed to be negligible and a 0 flow is assigned to them. It is fairly well defined to 5.0 cfs. No discharge measurements were made this water year. One observation of zero flow was made on March 2, 2009. The peak instantaneous flow occurred at 0915 May 9, 2009 (6.44 cfs, GH=0.88 ft, shift=-0.01 ft).

Discharge.-- Shifts were distributed on the basis of stage using the variable shift table from water year 2008 (ENTDITCOVS08A) from 0000 Oct 1, 2008 to the end of the water year. Discharge for the days when the floats appear to heave in the well were assumed to be zero.

Special Computations.-- Discharge for the days when mud blocked the intakes was estimated on the basis of a mass balance. Water in Long Hollow was the only available water source in the lower reach of the LaPlata River. The LaPlata River at Cherry Creek to the confluence of Long Hollow was 0. There are 3 ditches that can divert water from the LaPlata River between Long Hollow and the Colo/New Mexico Stateline (Sooner Valley Ditch, Pioneer Ditch and Enterprise Ditch). Sooner Valley and Pioneer Ditch did not divert water during the period of Aug. 10, 2009 to Sept. 10, 2009. The Enterprise Ditch flows were based on balance of 35% of the Long Hollow minus the flows at the LaPlata River at Colo/New Mexico Stateline. A transit loss of 35% from Long Hollow to the Colo/New Mexico Stateline was assumed.

Remarks.-- Record is complete and reliable except for the period Dec. 31, 2008, Jan. 1-31; Feb. 1-5, 2009 when ice caused the shaft encoder float to heave and Aug. 10-31; Sep. 1-10, 2009 when the intake was blocked by mud. Record during this period should be considered poor. Station maintained by Matt Schmitt and record developed by Brian Boughton.

Recommendations.-- Additional benchmarks should be established at the gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE--

ENTDITCO01 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

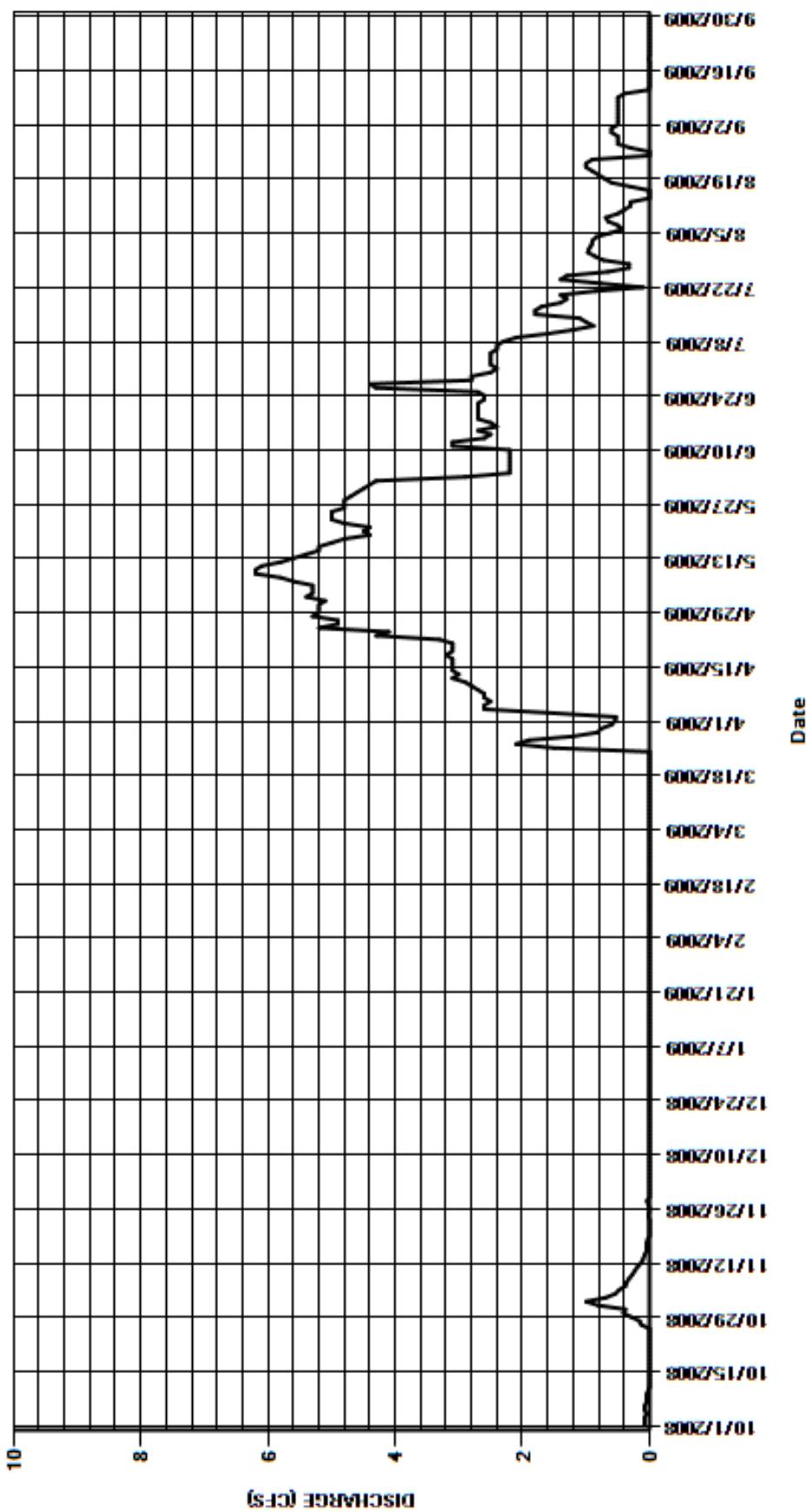
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
1	0.08	0.81	0	0	0	0	0.54	5.2	4.4	2.4	0.95	e0.6	
2	0.08	1	0	0	0	0	0.53	5.1	4.3	2.5	0.91	e0.5	
3	0.08	0.69	0	0	0	0	1.5	5.4	2.9	2.5	0.9	e0.5	
4	0.05	0.54	0	0	0	0	2.6	5.3	2.2	2.5	0.84	e0.5	
5	0.08	0.48	0	0	0	0	2.6	5.3	2.2	2.5	0.62	e0.5	
6	0.08	0.38	0	0	0	0	2.5	5.3	2.2	2.4	0.43	e0.5	
7	0.05	0.36	0	0	0	0	2.6	5.6	2.2	2.4	0.5	e0.5	
8	0.05	0.32	0	0	0	0	2.6	5.8	2.2	2.3	0.65	e0.5	
9	0.05	0.27	0	0	0	0	2.7	6.2	2.2	2.1	0.69	e0.5	
10	0.02	0.23	0	0	0	0	2.8	6.2	2.2	1.6	e0.5	e0.4	
11	0	0.19	0	0	0	0	2.9	6.1	3.1	1.2	e0.4	0.01	
12	0	0.13	0	0	0	0	3.1	5.8	3.1	0.88	e0.3	0	
13	0	0.1	0	0	0	0	3	5.6	2.6	1	e0.3	0	
14	0	0.08	0	0	0	0	3.1	5.4	2.5	1.1	e0	0	
15	0	0.05	0	0	0	0	3.1	5.2	2.7	1.8	e0	0	
16	0	0.05	0	0	0	0	3.1	5.2	2.4	1.8	e0	0	
17	0	0.05	0	0	0	0	3.1	5	2.5	1.7	e0.3	0	
18	0	0.03	0	0	0	0	3.2	4.8	2.7	1.4	e0.6	0	
19	0	0	0	0	0	0	3.1	4.4	2.7	1.3	e0.7	0.01	
20	0	0	0	0	0	0	3.1	4.5	2.7	1.4	e0.8	0	
21	0	0	0	0	0	0	3.1	4.4	2.7	0.85	e0.9	0	
22	0	0	0	0	0	0	3.3	4.8	2.7	0.1	e1	0	
23	0	0	0	0	0	0	4.3	5	2.6	0.77	e1	0	
24	0	0.02	0	0	0	0	4.1	5	2.6	1.4	e0.9	0	
25	0	0.01	0	0	0	0	1.5	5.2	5	2.7	1.3	e0	0
26	0	0	0	0	0	0	2.1	4.9	4.8	4.3	0.65	e0	0
27	0.13	0.02	0	0	0	0	1.9	4.9	4.8	4.4	0.32	e0.3	0
28	0.16	0.04	0	0	0	0	1.2	5.3	4.8	2.8	0.32	e0.5	0
29	0.29	0	0	0	---	0.82	5.2	4.7	2.8	0.73	e0.5	0	
30	0.41	0	0	0	---	0.76	5.2	4.6	2.5	0.86	e0.5	0	
31	0.38	---	0	0	---	0.6	---	4.5	---	0.97	e0.6	---	
TOTAL	1.99	5.85	0.00	0.00	0.00	8.88	97.27	159.8	84.1	45.05	16.59	5.02	
MEAN	0.064	0.19	0	0	0	0.29	3.24	5.15	2.8	1.45	0.54	0.17	
AC-FT	3.9	12	0	0	0	18	193	317	167	89	33	10	
MAX	0.41	1	0	0	0	2.1	5.3	6.2	4.4	2.5	1	0.6	
MIN	0	0	0	0	0	0	0.53	4.4	2.2	0.1	0	0	
CAL YR	2008	TOTAL	499.99	MEAN	1.37	MAX	5.4	MIN	0	AC-FT	992		
WTR YR	2009	TOTAL	424.55	MEAN	1.16	MAX	6.2	MIN	0	AC-FT	842		

MAX DISCH: 6.4 CFS AT 09:15 ON May. 09,2009 GH 0.88 FT. SHIFT -0.01 FT.

MAX GH: 0.88 FT. AT 09:15 ON May. 09,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE

Water Year 2009

Location.--	Lat. 36°59'59", Long. 108°11'17", in NW 1/4 SE 1/4 sec. 10, T.32 N., R.13 W., NMPM, La Plata County, CO, Hydrologic Unit 14080105, on right bank at Colorado-New Mexico State line, 0.5 mi downstream of Johnny Pond Arroyo, and 4.9 mi north of La Plata, NM.
Drainage and Period of Record.--	331 mi ² . Jan. 1920 to current year. Monthly data only for some periods.
Equipment.--	Stevens A-71 graphic water stage-recorder and Sutron Satlink 2 DCP and shaft encoder on separate floats in a 42-inch diameter concrete well and 64-inch by 64-inch cement block shelter. The floats are located inside of a 14 inch PVC oil cylinder. The primary reference gage is an electric drop tape inside the gage house. A drop tape inside the gage house is used to reference the gage when the well is frozen around the oil cylinder. The station is also equipped with an air temperature sensor. The control is a compound concrete long throated flume, hereafter referred to as a "ramp flume". A foot bridge located 6- feet downstream of the gage house is used for access and to make high flow measurements.
Hydrographic Conditions.--	The drainage area above the gage is 331 square miles. The basin begins in high mountain terrain above 11,000 feet and drops to 5,972 feet at the gage. The gage is located at the Colorado-New Mexico Stateline. The basin mainly consists of rock and forested mountains to an elevation of 8,000 feet (Hesperus) and changes to agricultural from Hesperus to the Stateline. Silt and gravel are deposited in the stilling pool above the control during low flow and scour during moderate to high flow events. Many diversions for irrigation occur above this gage.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 43 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted once on Jun. 15, 2009. The adjustment made was +0.01 feet. The shaft encoder was adjusted again on Jun. 18, 2009 where a -0.01 ft correction was applied. It was assumed the primary reference was misread on Jun. 15, 2009 and the +0.01 foot correction was removed within the final record. Five flush corrections were made this water year. The flush corrections occurred on Apr. 14, 2009 (+0.04 ft), Apr. 27, 2009 (+0.03 ft), May 11, 2009 (+0.06 ft), May 18, 2009 (+0.03 ft) and May 20, 2009 (+0.03 ft). The flush corrections were prorated by time within the final record from the time of the flush back to the time and location of a previous inflection point on the hydrograph. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Dec. 14-31, 2008; Jan. 1-23, 2009.
Datum Corrections.--	Levels were run on September 22, 2009 to the electric (ET index) and drop tape index (DT index) using RM #3 as the base. The ET index was found to be reading -0.002 feet low. The drop tape index was found to be reading +0.002 feet high. No corrections were made since the ET or DT index were within the allowable error tolerances. Levels were also run to the two other reference marks (RM#4 and RM#5). RM#4 was found to be reading +0.006 feet high and RM#5 was found to be reading +0.014 feet high. No corrections were made to the supplemental reference marks.
Rating.--	The ramp flume contains three definitive zones. The low flow zone looks like a concrete broad-crested Cipolletti weir, ranges in stage from 2.80-ft to 3.30-ft (or 0 cfs to approximately 1.16 cfs). The middle zone is concrete and ranges in stage from 3.30-ft to 5.37-ft or 1.16 cfs to 320 cfs. At higher flows ($GH = 5.37\text{-ft}$ to 8.40-ft) channel will overbank on the left side into a natural section lined with grass, trees and willows. The control section is located about 14 feet below the inlets to the gage. The point-of-zero-flow (PZF) is approximately 2.80-ft. Rating table No. 32, dated Oct. 1, 2002 was discontinued on Oct. 1, 2008. Rating table No. 33 was developed and used the remainder of the water year. It is fairly well defined from 0.20 to 572 cfs. The upper end of the rating table (above 1200 cfs) is based on the poor measurement made Sept. 9, 2003. The PZF was verified during 4 measurements (No. 1373, 1376, 1386 and 1389) made throughout the water year. Twenty measurements (No. 1372-1391) were made during the water year. They range in discharge from 0.20 to 141 cfs. They cover the range in stage experienced. The peak instantaneous flow at 1130 May 18, 2009 (146 cfs, $GH = 4.66\text{ ft}$, shift= 0.00 ft) was verified by measured at the same time.
Discharge.--	Shifts were applied as defined by measurements were distributed by time and stage. To ensure a smooth transition from water year 2008, variable shift curve LAPMEX08VSA was continued until 1110 on October 1, 2008, when Rating No. 32 ended and Rating No. 33 began. Shifts were distributed by time from 1200 Oct. 1, 2008 until 1558 Mar. 20, 2009 which is the last measurement (No. 1377) before spring runoff began. Shifts were distributed by stage starting with shift curve LAPMEX09VSA as defined by measurement Nos. 1377 - 1387 from 1600 Mar. 20, 2009 until 1500 Jul. 29, 2009. Shift curve LAPMEX09VSB defined the lower flows (measurement Nos. 1388 - 1391) which occurred from 1600 Jul. 29, 2009 until the end of the water year. Open-water measurements showed shifts varying between -0.03 and +0.02 feet. Shifts were applied directly and given full weight except measurement Nos. 1376, 1377, 1378, 1379, 1382, 1384 and 1386 which were discounted from -7% to +4% to smooth shift distribution. Measurement Nos. 1388, 1389 and 1390 were also discounted from -10% to +10% due to the very poor measurement conditions that existed in the natural channel. Flows for measurements No. 1388 to 1390 encompassed the range of flows from 0.20 cfs to 0.99 cfs. A stable control and multiple measurements from previous water years define the rating at or near the high water measurement made this year. Therefore the high flow measurement was adjusted to the rating within the error of the measurement. The shift for measurement No. 1375 was not used because the measurement was made while the stage-discharge relationship was ice affected.
Special Computations.--	Discharge for the days when ice affected the gage height record was estimated on the basis of partial days of good record, good gage data before and after ice affected data, air temperature data collected at the gage, and one measurement at the gage. A hydrograph was used.
Remarks.--	Record good, except for the period from Dec. 14-31, 2008; Jan. 1-23, 2009 when ice affected the stage-discharge relationship. Record during this period should be considered poor. Record during the period from May 4-18, 2009 should be considered fair due to large flush corrections. Station maintained by Matt Schmitt and Brian Boughton. Record developed by Brian Boughton.

Recommendations.--

None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE--

LAPMEXCO32 USED FROM 01-Oct-2008 TO 01-Oct-2008
LAPMEXCO33 USED FROM 01-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.7	4.3	6	e7	11	16	8.9	75	47	14	2.8	0.73
2	4	4	5.7	e7	11	16	9.1	66	41	14	1.7	0.87
3	4.5	4.3	6	e6.5	11	17	6.5	67	38	19	1.3	0.89
4	5.6	4.5	6	e6.5	11	20	6.6	40	41	18	0.85	0.95
5	9.3	5	6	e6.5	11	21	7.6	61	38	15	0.51	0.95
6	9.5	5.2	5.9	e7.5	11	25	6.5	58	38	13	0.63	1
7	7.4	5.3	5.8	e9	12	24	7.2	60	32	12	0.71	1.1
8	5.1	5.2	6.1	e9	12	20	8.2	63	27	8.3	0.6	1
9	4.4	5.2	6.4	e9	12	17	8.7	76	26	6.2	0.37	0.98
10	4	5.7	6.1	e8.5	13	17	9.9	87	25	4.8	0.67	0.79
11	3.9	6.1	6.4	e9	11	15	14	94	34	3.9	0.79	1.2
12	4.5	5.7	6.5	e9	12	14	19	83	19	2.8	0.68	1.2
13	5.6	5.6	6	e9	12	15	19	66	15	2.4	0.68	0.91
14	6.4	5.6	e6	e10	12	17	21	52	16	2	1.6	1.2
15	6.6	5.2	e5.8	e10	11	15	20	65	16	3.7	1.6	1.3
16	6.1	5.2	e6	e10	11	14	24	87	13	4	1.1	1.1
17	5.6	5.2	e6	e10	12	13	26	91	13	5.2	0.88	1.6
18	5.6	5.2	e6	e10	11	11	28	112	18	4.8	0.63	1.7
19	5.2	5.2	e5.5	e10	11	11	21	76	21	3.5	0.48	2
20	5.2	5.2	e5.5	e11	11	11	19	86	22	3.7	0.43	1.7
21	5.2	5.2	e5.5	e11	11	11	23	83	23	3.3	0.32	1.6
22	5.2	5.4	e6	e11	11	12	48	96	19	5.7	0.26	1.6
23	5.3	5.6	e6	e11	11	18	59	80	13	6.9	0.25	1.7
24	5.6	5.4	e5.5	11	13	25	56	89	13	5.5	0.48	1.7
25	5.6	5.4	e6	12	13	19	54	93	22	4.7	1.4	1.8
26	5.6	5.6	e5.5	12	14	15	50	60	36	5.6	1.5	1.7
27	5.5	6.2	e5.2	12	15	13	44	71	28	6	1.1	1.7
28	5	7.8	e5.2	11	15	11	73	69	26	5.5	0.94	1.6
29	4.9	6.7	e5.8	11	---	9.9	64	59	21	5.3	0.84	1.7
30	4.8	6.1	e6.5	11	---	9.4	64	52	17	4.5	0.79	1.6
31	4.8	---	e7	11	---	9.3	---	49	---	4.1	0.73	---
TOTAL	169.7	162.3	183.9	298.5	332	481.6	825.2	2266	758	217.4	27.62	39.87
MEAN	5.47	5.41	5.93	9.63	11.9	15.5	27.5	73.1	25.3	7.01	0.89	1.33
AC-FT	337	322	365	592	659	955	1640	4490	1500	431	55	79
MAX	9.5	7.8	7	12	15	25	73	112	47	19	2.8	2
MIN	3.7	4	5.2	6.5	11	9.3	6.5	40	13	2	0.25	0.73

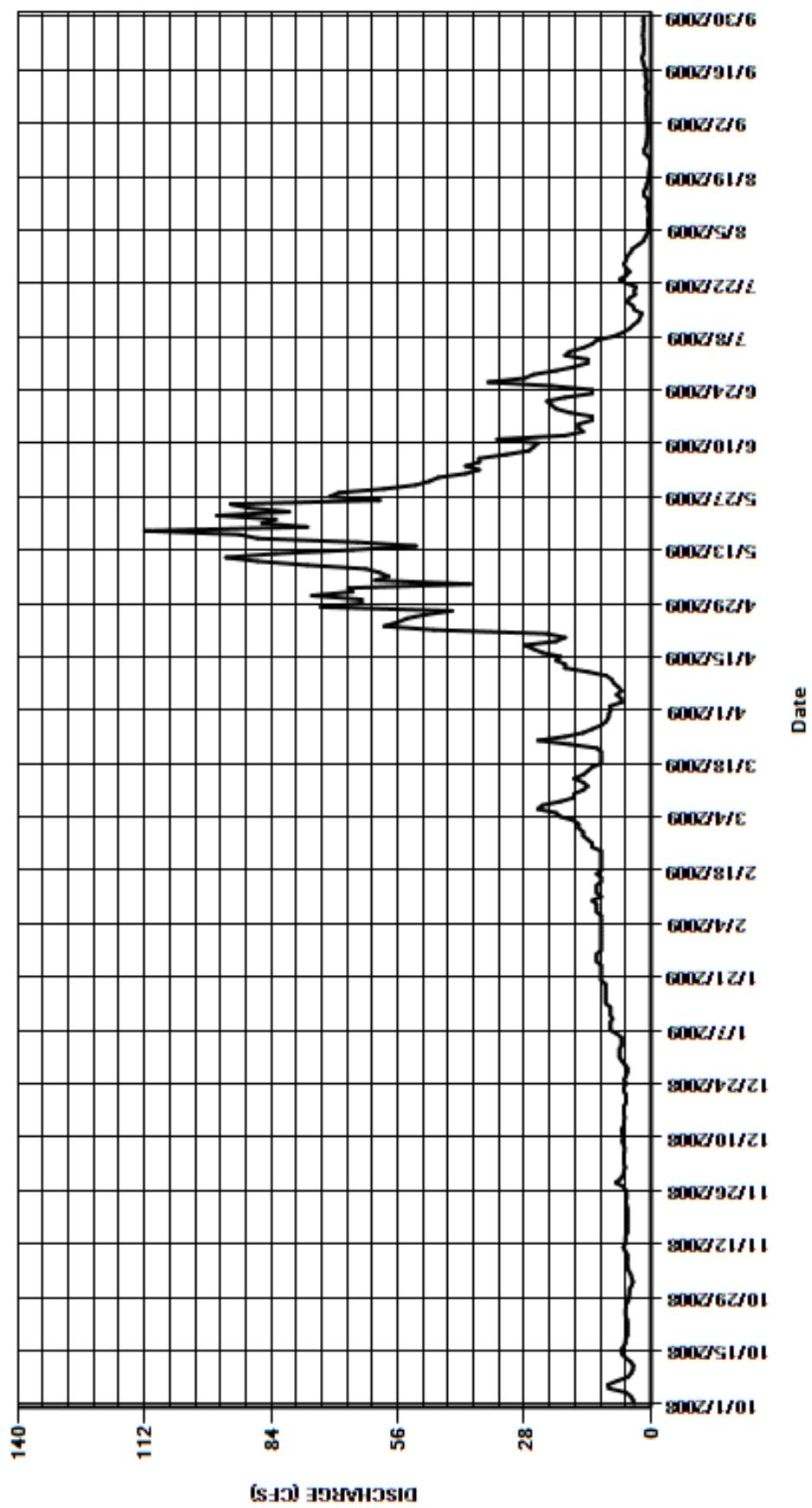
CAL YR	2008	TOTAL	11340.2	MEAN	31	MAX	182	MIN	3	AC-FT	22490
WTR YR	2009	TOTAL	5762.09	MEAN	15.8	MAX	112	MIN	0.25	AC-FT	11430

MAX DISCH: 146 CFS AT 11:30 ON May. 18,2009 GH 4.66 FT. SHIFT 0 FT.

MAX GH: 4.66 FT. AT 11:30 ON May. 18,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09366500 LAPLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE
WY2009 HYDROGRAPH



SAN JUAN RIVER BASIN
MANCOS RIVER NEAR MANCOS
Water Year 2009

Location.--	Lat. 37°21'13", Long. 108°15'41", in NE¼NE¼ sec. 27, T.36 N., R.13 W., NMPM, Montezuma County.
Drainage and Period of Record.--	72.6 mi ² .
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a concrete block shelter and a 42" concrete well. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). No changes.
Hydrographic Conditions.--	Large cobbles and boulders line the channel above and below the gage. Diversions for irrigation and filling reservoirs affect the flow at the gage.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record used for backup purposes. The gage was visited on 26 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted once on Feb. 5, 2009. The adjustment made was +0.01 feet. Six flush corrections were made this water year. The flush corrections occurred on Oct. 28, 2008 (+0.01 ft), Apr. 15, 2009 (+0.05 ft), May 6, 2009 (+0.09 ft), May 19, 2009 (+0.06 ft), Jun. 12, 2009 (+0.04 ft) and Jul. 7, 2009 (+0.03 ft). The flush corrections were prorated by time within the final record from the time of flush back to time and location of a previous inflection point on the hydrograph. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice: Nov. 6-8, 22-26, Dec. 4-7, 9-12, 14-21, 24, 26-28, 2008 ; Jan. 6, 8-14, 17-21, 27-31, Feb. 1-5, 7, 10-22, 28, March 8, 11, 27, 31, 2009 .
Datum Corrections.--	No levels were run this year. Levels were last run on August 16, 2007 using the RP as the base. Benchmark No. 1 and 2 were established at the time. No other benchmarks were established prior to this date.
Rating.--	The control is a rock riffle located directly below the gauge. The channel is the control at high flow. Shifts are caused by gravel and sand fill and scour on the control section with changes in stage. Rating No. 9, dated May 25, 2005, was used until October 28, 2008, at which time a new rating, MANMANCO10, was implemented. This rating was created as a result of an analysis of measurements from water year 2005 through the current water year. It was used the remainder of the water year. It is well defined from 0.99 cfs to 800 cfs (150% of the historical highest discharge measurement made in WY 2005). Seventeen measurements (Nos. 598 - 614) were made during the water year ranging in discharge from 3.21 cfs to 114 cfs. They cover the range in stage experienced except for the higher flow period of May 8-20, and 22-25, 2009. The peak instantaneous flow at 2300 May 12, 2009 (221 cfs, GH = 4.58 ft, shift=0.00 ft) exceeded the stage of measurement No. 606, made May 20, 2009 by 0.27 feet in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by gravel and sand filling and scouring on the control section. Shifts were distributed by stage for the entire water year. Variable shift curve MANMANCOVS08B was used from the beginning of the water year to October 28, 2008 at 10:51, at which time variable shift curve MANMANCO09 was implemented for the duration of the water year. Measurements show shifts varying from 0.10 feet to -0.02 feet. Shifts were applied directly and given full weight except Measurement Nos. 602, 603, 604, 606, and 612, which were discounted from -8% to 8%. Shifts for measurement 600, 605 and 608 were not used. Measurement No. 600 was during a period of ice-affected stage. Measurement No. 605 had anomalous results, and measurement No. 608 was an ADCP measurement performed under poor conditions
Special Computations.--	Discharge for periods of ice affect were estimated on the basis of partial day record, interim good record, and NOAA air temperature records (Mancos.5327.NOAA). A hydrograph was used.
Remarks.--	Record good, except for those periods of ice affected records, which are poor. Station maintained and record developed by Jason Morrow.
Recommendations.--	A threshold should be installed below the shelter door to prevent mice and rodents from entering the shelter.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MANCOS RIVER NEAR MANCOS

RATING TABLE--

MANMANCO09 USED FROM 01-Oct-2008 TO 28-Oct-2008
MANMANCO10 USED FROM 28-Oct-2008 TO 30-Sep-2009

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

MEAN VALUES

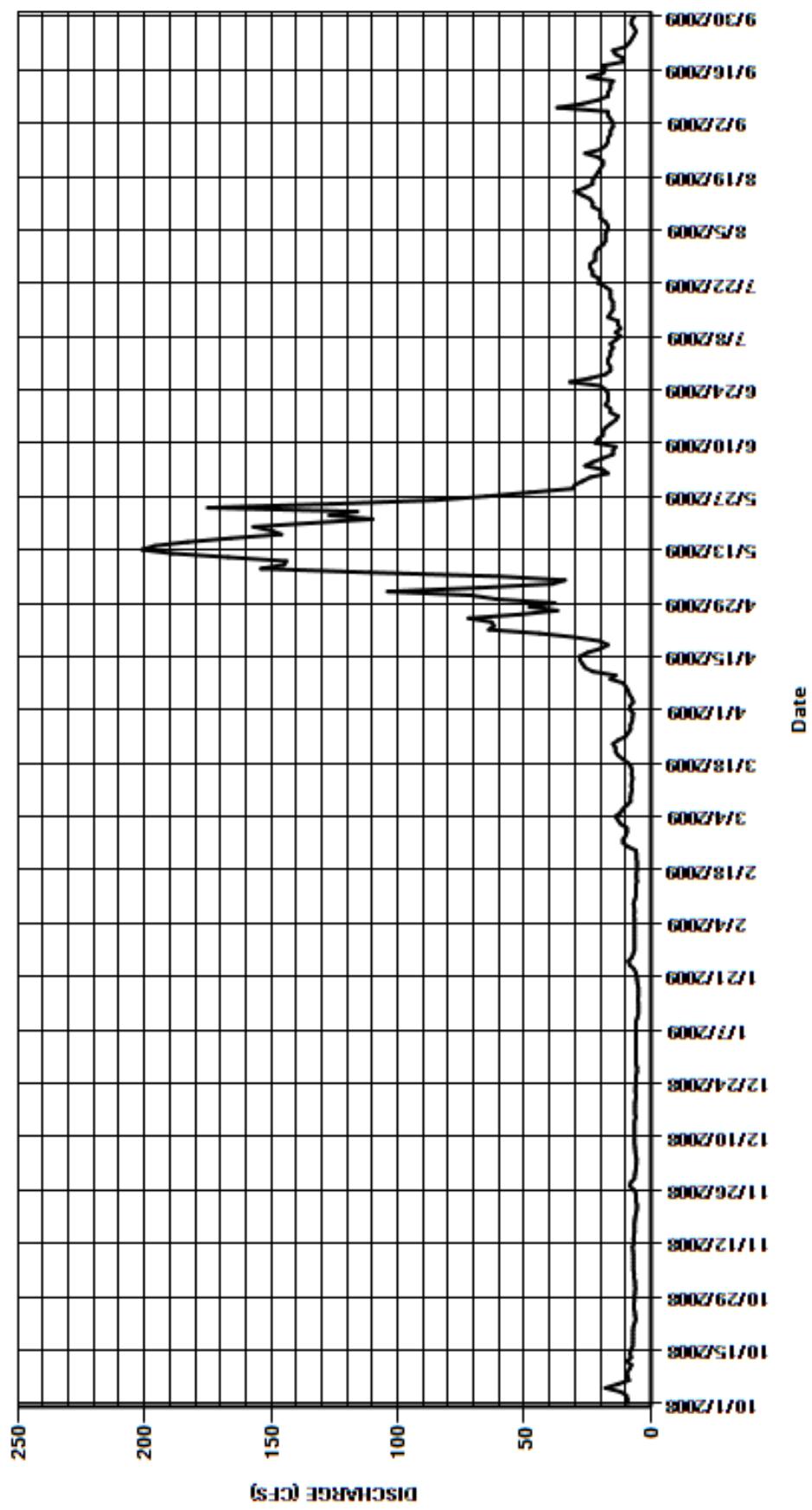
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.2	6.3	6.1	5.9	e6.5	9.6	8.2	71	24	17	19	15
2	9.2	6.3	5.9	5.9	e6.5	12	8.2	104	17	17	18	15
3	9.7	6.8	5.8	5.9	e6.5	13	7	68	19	16	18	16
4	12	6.6	e5.7	5.9	e6.5	14	7.5	39	26	16	18	17
5	18	7	e6	5.9	e6.5	12	8.6	34	23	15	17	17
6	13	e7	e6.2	e5.9	6.7	11	9	60	19	16	17	37
7	8.7	e7	e6.3	6	e6.5	9.4	9.9	111	15	14	18	27
8	9.2	e7	6.5	e6	6.6	e8	11	154	15	12	20	21
9	9.5	7	e6.5	e6	e6.9	8.1	16	145	14	14	20	17
10	8.5	7.1	e6.5	e5.5	e6.5	7.9	14	144	22	12	20	17
11	7.7	7.3	e6.5	e5	e6	e7.5	23	167	21	13	23	16
12	9.5	6.7	e6.5	e5	e6	7.8	26	189	19	13	23	16
13	7.8	6.9	6.6	e5	e6	7.6	27	201	19	17	24	15
14	8.3	6.8	e6.5	e5	e6	7.2	28	196	18	16	27	25
15	7.9	6.5	e6	5.1	e5.5	7.7	28	183	16	15	30	19
16	7.2	6.6	e6.3	5	e5.8	7.5	25	166	14	15	26	18
17	7.2	6.6	e6.3	e5	e5.8	7.9	20	146	13	15	23	19
18	7.1	6.4	e6.3	e5	e5.5	9.1	17	150	16	16	23	11
19	7.1	6.2	e6.3	e5.3	e5.5	11	20	157	16	16	22	11
20	7.1	5.8	e6	e5.5	e5.5	13	30	134	18	16	21	14
21	7	5.6	e6	e5.7	e5.8	14	44	110	17	18	20	15
22	6.5	e5.5	6.2	6	e5.8	14	64	127	17	21	19	10
23	6	e6	6.1	6.8	5.9	15	62	116	17	20	19	8.6
24	6.3	e6	e6	8.4	9	13	63	175	18	23	21	7.6
25	6.4	e6	5.9	8.9	11	10	72	126	20	23	26	6.7
26	6.8	e6.8	e5.9	7.6	11	8.9	52	85	32	24	20	5.9
27	6.7	8.4	e5.5	e7	9.9	e8	37	65	24	24	18	6.7
28	6.6	7.9	e5.5	e6.5	e9.5	8.1	48	48	18	22	17	7.8
29	6.5	6.5	5.9	e6.5	---	7.4	38	31	16	22	17	7.6
30	6.4	6.4	5.9	e6.5	---	7.3	61	30	16	22	16	6.5
31	6.2	---	5.9	e6.5	---	e7	---	27	---	21	16	---
TOTAL	255.3	199.0	189.6	186.2	191.2	304.0	884.4	3559	559	541	636	445.4
MEAN	8.24	6.63	6.12	6.01	6.83	9.81	29.5	115	18.6	17.5	20.5	14.8
AC-FT	506	395	376	369	379	603	1750	7060	1110	1070	1260	883
MAX	18	8.4	6.6	8.9	11	15	72	201	32	24	30	37
MIN	6	5.5	5.5	5	5.5	7	7	27	13	12	16	5.9
CAL YR	2008	TOTAL	12374.5	MEAN	33.8	MAX	268	MIN	4.5	AC-FT	24540	
WTR YR	2009	TOTAL	7950.1	MEAN	21.8	MAX	201	MIN	5	AC-FT	15770	

MAX DISCH: 221 CFS AT 23:00 ON May. 12,2009 GH 4.58 FT. SHIFT 0 FT.

MAX GH: 4.58 FT. AT 23:00 ON May. 12,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MANCOS RIVER NEAR MANCOS
WY2009 HYDROGRAPH



Station Identification Codes

DIV I

CODE	NAME
ADATUNCO	ALVA B. ADAMS TUNNEL AT EAST PORTAL, NEAR ESTES PARK
ADANETCO	ALVA B. ADAMS TUNNEL AT EAST PORTAL (NET), NEAR ESTES PARK
BCRMORCO	BEAR CREEK AT MORRISON
BCRSHECO	BEAR CREEK AT SHERIDAN
BERDITCO	BERTHOUD PASS DITCH AT BERTHOUD PASS
BFCLYOCO	BOULDER CREEK FEEDER CANAL NEAR LYONS
BIGLASCO	BIG THOMPSON AT MOUTH, NEAR LA SALLE
BOBGLNCO	BOB CREEK DITCH NEAR GLENDEVEY
BOCBGRCO	SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
BOCELSCO	SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
BOCMIDCO	MIDDLE BOULDER CREEK AT NEDERLAND
BOCOBODO	BOULDER CREEK AT BOULDER
BOCOROCO	BOULDER CREEK NEAR ORODELL
BORDITCO	BOREAS PASS DITCH AT BOREAS PASS
BOSDELCO	SOUTH BOULDER CREEK, DIVERSION NR ELDORADO SPRINGS
BTABESCO	BIG THOMPSON RIVER ABOVE LAKE ESTES
BTBLESCO	BIG THOMPSON RIVER BELOW LAKE ESTES
BTCANYCO	BIG THOMPSON RIVER AT MOUTH OF CANYON, NEAR DRAKE
BTPPMCCO	CHARLES HANSEN FEEDER CANAL POWER PLANT TO BIG THOMPSON
BUCRMVCO	BUCKHORN CREEK NEAR MASONVILLE
BTNFDRCO	NORTH FORK BIG THOMPSON RIVER AT DRAKE
CAPDCPCO	CAMERON PASS DITCH NEAR CAMERON PASS
CLAFTCCO	CACHE LA POUDRE AT CANYON MOUTH, NEAR FORT COLLINS
CLAGRECO	CACHE LA POUDRE NEAR GREELEY
CLAWASCO	CACHE LA POUDRE AT GREELEY WASTEWATER TREATMENT PLANT
CLEDERCO	CLEAR CREEK AT DERBY
COCREPCO	COAL CREEK NEAR PLAINVIEW
DEADDPCO	DEADMAN DITCH NEAR DEADMAN PARK
DILTUNCO	DILLE TUNNEL NEAR DRAKE
FALIDACO	FALL RIVER AT MOUTH NEAR IDAHO SPRINGS
FISHESCO	FISH CREEK NEAR ESTES PARK
GRNDRDCO	GRAND RIVER DITCH AT LA POUDRE PASS
GUMCLRCO	A.P. GUMLICK TUNNEL RELEASE TO CLEAR CREEK AT JONES PASS
HFCBBSCO	CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
HFCWASCO	CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON
HOMSPICO	AURORA HOMESTAKE PIPELINE
HSPTUNCO	HOOSIER PASS TUNNEL AT MONTGOMERY RES., NEAR ALMA
LAPTUNCO	LARAMIE POUDRE TUNNEL
LEFTHDCO	LEFTHAND DIVERSION S. ST. VRAIN CREEK NEAR WARD
LTCANYCO	LITTLE THOMPSON RIVER AT CANYON MOUTH, NEAR BERTHOUD
MICDCPCO	MICHIGAN DITCH AT CAMERON PASS
MIDSTECO	MIDDLE ST. VRAIN CREEK NR. PEACEFUL VALLEY
MOFTUNCO	MOFFAT WATER TUNNEL, GILPIN COUNTY
OLYTUNCO	OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL) AT LAKE ESTES
ONEJURCO	SOUTH PLATTE RIVER AT JULESBURG CHANNEL #1
PIOHDGCO	PIONEER DITCH AT HEADGATE
PIOSTLCO	PIONEER DITCH AT CO/NE STATE LINE
PLAANTCO	SOUTH PLATTE RIVE BELOW ANTERO RESERVOIR
PLABALCO	SOUTH PLATTE RIVER AT COOPER BRIDGE, NEAR BALZAC
PLACHACO	SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
PLACHECO	SOUTH PLATTE RIVER BL. CHEESMAN RESERVOIR
PLADENCO	SOUTH PLATTE RIVER AT DENVER
PLAGEOCO	SOUTH PLATTE RIVER NEAR LAKE GEORGE
PLAGRACO	NORTH FORK SOUTH PLATTE RIVER AT GRANT
PLAHARCO	SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
PLAHENCO	SOUTH PLATTE RIVER AT HENDERSON
PLAJUCCO	SOUTH PLATTE RIVER AT JULESBURG COMBINED
PLAJULCO	SOUTH PLATTE RIVER AT JULESBURG LEFT CHAN. #4
PLAJURCO	SOUTH PLATTE RIVER AT JULESBURG RIGHT CHAN. #2
PLAKERCO	SOUTH PLATTE RIVER NEAR KERSEY
PLASPICO	SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
PLASPLCO	SOUTH PLATTE RIVER AT SOUTH PLATTE
PLASTRCO	SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
PLAWATCO	SOUTH PLATTE RIVER AT WATERTON
PLAWELCO	SOUTH PLATTE RIVER NEAR WELDONA
ROBTUNCO	ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
SKYDCLCO	SKYLINE DITCH AT CHAMBERS LAKE
SSVWARCO	SOUTH ST. VRAIN NEAR WARD
STCTUNCO	STRAIGHT CREEK TUNNEL AT EISENHOWER TUNNEL
STLINECO	STATELINE DITCH RETURN NEAR JULESBURG
SVCLYOCO	SAINT VRAIN CREEK AT LYONS
SVCPLACO	ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE

SVSLYOCO	ST. VRAIN SUPPLY CANAL NEAR LYONS
TARBORCO	TARRYALL CREEK AT BORDEN DITCH NEAR JEFFERSON
TARTARCO	TARRYALL CREEK BELOW TARRYALL RESERVOIR
VIDTUNCO	VIDLER TUNNEL NEAR ARGENTINE PASS
WINDESCO	WIND RIVER NEAR ESTES PARK
WINBYPCO	WIND RIVER BY-PASS NEAR ESTES PARK
WSDEARCO	WILSON SUPPLY DITCH NEAR EATON RESERVOIR

DIV II

CODE	NAME
ARKCACCO	ARKANSAS RIVER AND CATLIN CANAL COMBINED
ARKCANCO	ARKANSAS RIVER AT CANYON CITY
ARKCARCO	ARKANSAS RIVER BELOW X-Y DITCH DAM NEAR CARLTON
ARKCATCO	ARKANSAS RIVER BELOW CATLIN DAM NEAR FOWLER
ARKGRNCO	ARKANSAS RIVER AT GRANITE
ARKLAJCO	ARKANSAS RIVER AT LA JUNTA
ARKNEPCO	ARKANSAS RIVER NEAR NEPESTA
ARKNECCO	ARKANSAS RIVER AT NEPESTA ROAD BRIDGE COMBINED
ARKPORCO	ARKANSAS RIVER AT PORTLAND
ARKPUECO	ARKANSAS RIVER ABOVE PUEBLO
ARKROCCO	ARKANSAS RIVER AT ROCKY FORD
ARKSALCO	ARKANSAS RIVER AT SALIDA
ARKWELCO	ARKANSAS RIVER NEAR WELLSVILLE
BOUTUNCO	CHARLES H. BOUSTEAD TUNNEL
BUSTUNCO	BUSK-IVANHOE TUNNEL
CATCANCO	CATLIN CANAL AT CATLIN DAM, NEAR FOWLER
CANSWKCO	CROOKED ARROYO NEAR SWINK
CCACCRCO	CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
CCBCCRCO	CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
CHCRNACO	CHALK CREEK AT NATHROP
COLDITCO	COLUMBINE DITCH
COCRBVCO	COTTONWOOD CREEK NEAR BUENA VISTA
CRBRLVCO	CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
CRHBLVCO	CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA
EWIDITCO	EWING DITCH
GRAWESCO	GRAPE CREEK NEAR WESTCLIFFE
HILCANCO	HIGHLAND CANAL BELOW HIGHLAND DAM NEAR LAS ANIMAS
HOMTUNCO	HOMESTAKE TUNNEL
HRC194CO	HORSE CREEK AT HIGHWAY 194
HURREDCO	HUERFANO RIVER NEAR REDWING
LAKATLCO	LAKE CREEK ABOVE TWIN LAKES RESERVOIR
LAKBTLCO	LAKE CREEK BELOW TWIN LAKES RESERVOIR
LARDITCO	LARKSPUR DITCH AT MARSHALL PASS
LFCBSLCO	LAKE FORK CREEK BELOW SUGAR LOAF DAM NR. LEADVILLE
MUDTOOCO	MUDGY CREEK NEAR TOONERVILLE
NMCHIGCO	NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
OXFDITCO	OXFORD FARMERS DITCH NEAR NEPESTA
PURHILCO	PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS
PURHICCO	PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS (COMBINED)
PURNICCO	PURGATOIRE R AT NINEMILE DAM, NR HIGBEE COMBINED
PURNINCO	PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE
PURTRICO	PURGATOIRE RIVER AT TRINIDAD
RACRSTCO	RATON CREEK ABOVE STARKVILLE
RULTOOCO	RULE CREEK NEAR TOONERVILLE
TWITUNCO	TWIN LAKES TUNNEL
WURDITCO	WURTZ DITCH NEAR TENNESSEE PASS
WUREXTCO	WURTZ EXTENSION DITCH NEAR TENNESSEE PASS

DIV III

CODE	NAME
ALABELCO	ALAMOSA CREEK BELOW TERRACE RESERVOIR
ALARANCO	ALAMOSA RIVER BELOW RANGER CREEK
ALATERCO	ALAMOSA CREEK ABOVE TERRACE RESERVOIR
ALAWIGCO	ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
BIGSPGCO	BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
CARLAGCO	CARNERO CREEK NEAR LA GARITA
CBPALACO	CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
CHECRECO	CHERRY CREEK NEAR CRESTONE
COCRMICO	COTTON CREEK NEAR MINERAL HOT SPRINGS
COCRESCO	COTTONWOOD CREEK NEAR CRESTONE
CONLASCO	COMBINED CONEJOS RIVER (NORLASCO SOULASCO)

CONMOGCO	CONEJOS RIVER NEAR MOGOTE
CONPLACO	CONEJOS RIVER BELOW PLATORO RESERVOIR
CULSANCO	CULEBRA CREEK AT SAN LUIS
DEDCRECO	DEADMAN CREEK NEAR CRESTONE
DLFDT0CO	DON LA FONT DITCH, COMBINED, AT PIEDRA PASS
DLFDT1CO	DON LA FONT DITCH NO. 1 AT PIEDRA PASS
DLFDT2CO	DON LA FONT DITCH NO. 2 AT PIEDRA PASS
GARVILCO	GARNER CREEK NEAR VILLA GROVE
GOOWAGCO	GOOSE CREEK AT WAGONWHEEL GAP
KERVILCO	KERBER CREEK NEAR VILLA GROVE
LAGLAGCO	LA GARITA CREEK NEAR LA GARITA
LAJCAPCO	LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
LITSPGCO	LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA
LOSORTCO	LOS PINOS RIVER NEAR ORTIZ
MAJVILCO	MAJOR CREEK NEAR VILLA GROVE
NCLCONCO	NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
NOCRESKO	CRESTONE CREEK, NORTH NEAR CRESTONE
NORDLSCO	NORTON DRAIN NEAR LA SAUSES
NORDSCCO	SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
NORLASCO	NORTH CHANNEL CONEJOS RIVER NEAR LASAUSES
PINDELCO	PINOS CREEK NEAR DEL NORTE
PRWDITCO	PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
RIOALACO	RIO GRANDE RIVER AT ALAMOSA
RIODELCO	RIO GRANDE NEAR DEL NORTE
RIOLINCO	RIO GRANDE AT RIO GRANDE-ALAMOSA COUNTY LINE
RIOLOBCO	RIO GRANDE NEAR LOBATOS
RIOMILCO	RIO GRANDE AT THIRTY MILE BRIDGE
RIOMONCO	RIO GRANDE AT MONTE VISTA
RIOSFKCO	SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
RIOTRICO	RIO GRANDE RIVER ABOVE THE MOUTH OF TRINCHERA CREEK
RIOWAGCO	RIO GRANDE RIVER AT WAGONWHEEL GAP
RITCRECO	RITO ALTO CREEK NEAR CRESTONE
SAGSAGCO	SAGUACHE CREEK NEAR SAGUACHE
SANCRECO	SAN ISABEL CREEK NEAR CRESTONE
SANFTGCO	SANGRE DE CRISTO CREEK NEAR FT. GARLAND
SANMANCO	SAN ANTONIO RIVER NEAR MANASSA
SANORTCO	SAN ANTONIO RIVER AT ORTIZ
SOUCRECO	SOUTH CRESTONE CREEK NEAR CRESTONE
SOULASCO	SOUTH CHANNEL CONEJOS RIVER NEAR LASAUSES
SPACRECO	SPANISH CREEK NEAR CRESTONE
TABDITCO	TABOR DITCH AT SPRING CREEK PASS
TARBELCO	TARBELL DITCH NEAR COCHETOPA PASS
TREDITCO	TREASURE PASS DITCH AT WOLF CREEK PASS
TRIMTNCO	TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR
TRISMICO	TRINCHERA CREEK BELOW SMITH RESERVOIR
TRITURCO	TRINCHERA CREEK AB. TURNER'S RANCH
UTEFTGCO	UTE CREEK NEAR FORT GARLAND
WCSDITCO	WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
WEMDITCO	WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WFKMOUCO	WIGHTMAN FORK AT MOUTH AT ALAMOSA RIVER
WFKCROCO	WIGHTMAN FORK BELOW CROPSY CREEK NEAR SUMMITVILLE
WILCRECO	WILLOW CREEK NEAR CRESTONE

DIV IV

CODE	NAME
ABCLATCO	ABC LATERAL
GUNREDCO	GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
MUDAPRCO	MUDDY CREEK ABOVE PAONIA RESERVOIR
MUDBPRCO	MUDDY CREEK BELOW PAONIA RESERVOIR
RLCGRJCO	REDLANDS CANAL NR GRAND JUNCTION
SOUCANCO	SOUTH CANAL NR MONTROSE
UNCOLACO	UNCOMPAGRE RIVER NEAR OLATHE

DIV V

CODE	NAME
BLUNINCO	BLUE RIVER AT HIGHWAY 9 BRIDGE
CHAGULCO	CHAPMAN GULCH NEAR NAST
CRYDOWCO	CRYSTAL RIVER AT DOW FISH HATCHERY NEAR CARBONDALE
FRYIVLCO	FRYINGPAN RIVER NEAR IVANHOE LAKE
FRYMERCO	FRYINGPAN RIVER AT MEREDITH
FRYNFNCO	NORTH FORK FRYINGPAN RIVER NEAR NORRIE

FRYSFUCO	SOUTH FORK FRYINGPAN RIVER AT UPPER STATION
FRYTHOCO	FRYINGPAN RIVER NEAR THOMASVILLE
IVCRNACO	IVANHOE CREEK NEAR NAST
ROABMCCO	ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN
ROAFRYCO	ROARING FORK RIVER ABOVE MOUTH OF FRYINGPAN RIVER NEAR BASALT
RFCMERCO	ROCKY FORK CREEK NEAR MEREDITH
SNAKEYCO	SNAKE RIVER AT KEYSTONE
WSDRAVCO	WEST DIVIDE CREEK NEAR RAVEN

DIV VI

CODE	NAME
ILLRANCO	ILLINOIS RIVER NEAR RAND
MICMERCO	MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
MICWLDCO	MICHIGAN RIVER NEAR WALDEN
MORBSCCO	MORRISON CREEK BELOW SILVER CREEK
PTCKSLCO	POT CREEK AT UTAH-COLORADO STATELINE NEAR VERNAL
WILBSLCO	WILLOW CREEK BELOW STEAMBOAT LAKE
WLTNCKCO	WALTON CREEK NEAR STEAMBOAT SPRINGS
WMFKHMCO	WILLIAMS FORK AT MOUTH NEAR HAMILTON
YAMABVCO	YAMPA RIVER ABOVE LAKE CATAMOUNT

DIV VII

CODE	NAME
ANIHOWCO	ANIMAS RIVER NEAR HOWARDSVILLE
BLADIVCO	BLANCO DIVERSION NEAR PAGOSA SPRINGS
CHEREDCO	CHERRY CREEK AT THE MOUTH NEAR RED MESA
DOLBMCCO	DOLORES RIVER BELOW MCPHEE RESERVOIR
DOLTUNCO	DOLORES TUNNEL OUTLET NEAR DOLORES
ENTDITCO	ENTERPRISE DITCH AT THE COLO-NEW MEXICO STATELINE
FLOALECO	FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
FLOBLECO	FLORIDA RIVER BELOW LEMON RESERVOIR
LAPHESCO	LA PLATA RIVER AT HESPERUS
LAPMEXCO	LA PLATA RIVER AT THE COLORADO/NEW MEXICO LINE
LITOSOCO	LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DAM NEAR CHROMO
LONREDCO	LONG HOLLOW AT THE MOUTH NEAR RED MESA
LOSODVCO	LITTLE OSO DIVERSION NEAR CHROMO
LPCDITCO	LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS
MANMANCO	MANCOS RIVER NEAR MANCOS
MVIDIVCO	LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
NAVBARCO	NAVAJO RIVER AT BANDED PEAKS RANCH NEAR CHROMO
NAVOSOCO	NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
OSODIVDO	OSO DIVERSION NEAR CHROMO
PINDITCO	PINE RIDGE DITCH NEAR HESPERUS
PIODITCO	PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
RIOBLACO	RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
RIOMOUCO	RIO BLANCO AT THE MOUTH NEAR TRUJILLO